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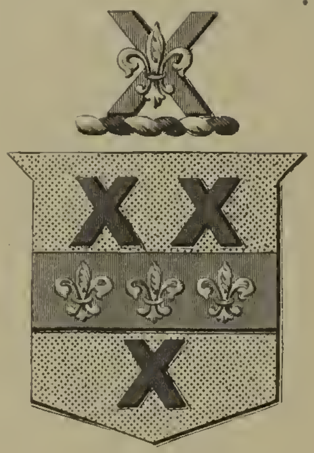
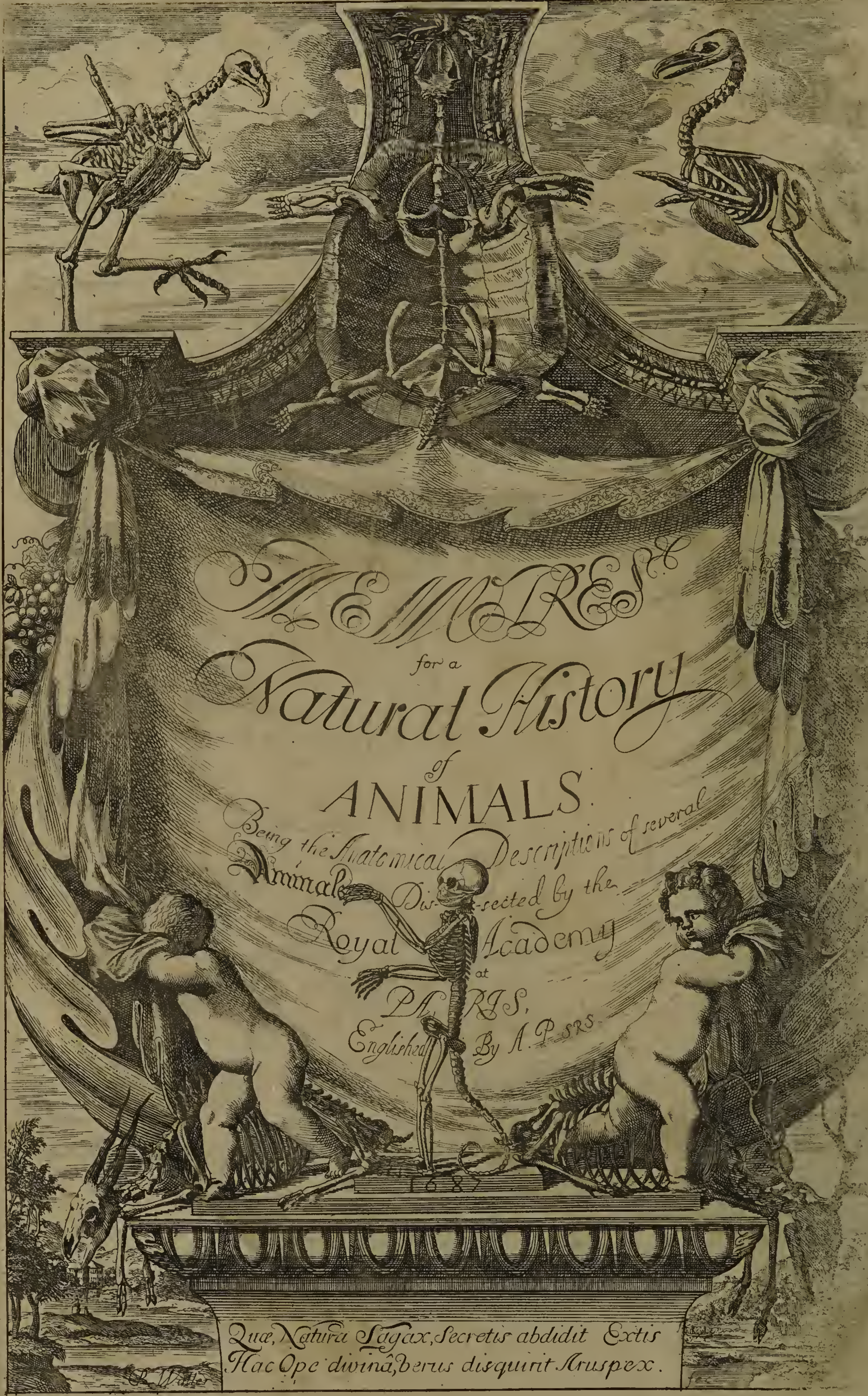


E. Barclay-Smith, M.D.



# MEMOIRES
for a
Natural History
of
ANIMALS
Being the Anatomical Descriptions of several Animals Dis-sected by the Royal Academy at PARIS.

Englished By A. P. S.R.S.

Quæ, Natura Sagax, Secretis abdidit Extis
Hac Ope divinâ, verus disquirit Aruspex.

46256

THE
NATURAL HISTORY
OF
ANIMALS

CONTAINING THE
Anatomical Deſcription
OF SEVERAL
CREATURES
DISSECTED BY
The Royal Academy
OF
SCIENCES at PARIS.

WHEREIN

Academie des Sciences

The Conſtruction, Fabrick and genuine Uſe of the Parts, are exactly and finely delineated in Copper Plates, and the whole Enriched with many Curious Phyſical and no leſs uſeful Anatomical Remarks, being one of the moſt Conſiderable Productions of that Academy.

Done into Engliſh by a Fellow of the Royal Society.

To which is added

An Account of the Meaſure of a Degree of a great Circle of the Earth, Publiſhed by the Members of the ſame Academy: Engliſh'd by *R. W.* SRS.

With an *Alphabetical Table* of the Names of the ſeveral Animals mention'd in this Volume. And likewiſe an *Alphabetical Index* to make the Work Compleat.

Publiſh'd by an Order of Council of the **Royal Society**

LONDON,
Printed for *R. Smith*, at the *Angel* and *Bible* without *Temple Barr*, 1702.

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MEMOIRES
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OF
ANIMALS

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THE PREFACE,

HISTORY, of what Nature ſoever it be, is written after two Ways: In the one are related all the things which have been at ſeveral times collected, and which do belong to the Subject it Treats off. In the other we are confined to the Narrative of ſome particular Acts, of which the Writer has a certain knowledge. This laſt way, which the *Romans* did call *Commentaries*, and the *French*, *Memoires*; although it contains only the Parts, and as it were the Elements which do compoſe the Body of Hiſtory, and has not the Majeſty found in that which is general, yet claims this Advantage; that Certainty and Truth, which are the moſt recomendable Qualities of Hiſtory, cannot be wanting in it, provided the Writer be exact and ſincere; which is not ſufficient for the general Hiſtorian, who oftentimes cannot be true, how deſirous ſoever he be after the Truth, and what care ſoever he imploy's to diſcover it; becauſe he is allwayes in danger of being deceived by the *Memoires* on which he builds.

We have ſtore of Hiſtories of Animals of both theſe wayes; For beſides the great and Magnificent Works which *Ariſtotle*, *Pliny*, *Solinus*, and *Ælian* have compoſed of what they found in other Authors, or which they learnt from thoſe who had made ſome Obſervations themſelves; We have likewiſe ſome perticular Relations which Travellers have written, of Abundance of Animals which are found onely in the Countries where they have been: And thoſe who have made the Deſcription of the ſeveral Parts of the World, have not forgotten that of the Animals which are there to be found. But it may be ſaid that there is not found any certainty in theſe Hiſtories, nor in theſe Relations. Thoſe who have writt the General Hiſtory of Animals, have thought to render it ſufficiently acceptable by the great number of things which they do relate, and by the diſtribution which they do make of the Animals into their different Species; with their reſemblances and differences which are found in their parts of which the various conformation, and all their Natural properties are ranged in ſome common *Claſſes*. For it is in this that they have chiefly imployed their dilligence and induſtry, the reſt not belonging to them, but to thoſe who had made the Deſcription of the Animals on the places, and whoſe exactneſs and fidelitie could not be ſufficiently known to them, to anſwer for them. So that the Materials, of which theſe Authors have compoſed their Works, being for the moſt part defective and layd on ſandy Foundations, it may be truly ſaid that the great Structure which they have afterwards built thereon, with ſo curious a Symmetry, has no real Solidity.

Therefore the Curious and Learned, who had formerly but little valued the worke of *Petrus Gillius*, when he undertook to methodize what *Ælian*, had confuſedly related of Animals, have been much concerned at the loſs of the excellent Remarks which he afterwards made, in the Travels which *Francis*. I. Cauſed him to take into Forreign Countries. For he was a very Judicious and perſpicacious Man; who was inſtructed by reading of all Authors that writt on this Subject, and was purpoſely ſent by the King to make this ſearch, and who applied himſelfe thereunto with a particular care; which made him capable of obſerving whatever was remarkable in Animals.

The want of theſe Qualifications, in the generality of thoſe which have made particular Relations and *Memoires*, renders their Labour inconſiderable, and their Teſtimony very ſuſpitious: It being ſcarcely probable, that Merchants and Souldiers are indowed with the Spirit of Philoſophy and Patience, which are neceſſary for the obſerving all the nice Particularities of ſo many different Animals, whoſe extraordinary ſhape did at firſt ſatisfy all their Curoioſity, as being capable of ſufficiently enriching their Relations; without judging it neceſſary to proceed to an exacter Scrutiny. But that which yet more leſſens the Eſteem for theſe ſorts of *Memoires*, is the unfaithfulneſs which Travellers do generally uſe in their Relations; who almoſt always add to the things they have ſeen, thoſe which they might have ſeen; And leaſt the Narrative of their Travels ſhould ſeem imperfect, do recite what they have read in Authors, by whom they are firſt deceived, juſt as they do afterwards deceive their Readers. This is the Reaſon why the Proteſtations which ſeveral of theſe Obſervers, as *Belonius*, *Piſo*, *Margravius*, and ſome others do make, to ſay nothing but what they have ſeen, and the Aſſurances which they do give of having diſcovered a great many of the falſities which have been writt before them, have ſcarce any other effect, than to render the ſinceritie of all Travellers very ſuſpect, becauſe that theſe Cenſurers of the good Credit and exactneſs of others, do not give ſufficient Cautions of their own.

That which is moſt conſiderable in our *Memoires*, is that unblemiſhable evidence of a certain and acknowledged Verity. For they are not the Work of one private Perſon, who may ſuffer himſelf to be prevail'd upon by his own Opinion; who can hardly perceive what contradicts his firſt Conceptions, for which he has all the blindneſs and fondneſs, which every one has for his own Children; who is not contradicted in the fredom that he allows himſelfe, of uttering what ever he thinks capable of adding luſter to his Work; and indeed who leſs conſiders the Truth of the Facts, which are not his own Production, than that order he gives it, and which he frames to himſelfe, of ſome praticularities which he ſuppoſes, or diſguiſes, to indeavour to ſuite them to his own Deſign: So that he would be in ſome Meaſure concerned at the finding out of Truths, and making Experiments which would deſtroy his fine Speculations. But theſe Inconveniencies are not to be found in our *Memoires*, which do contain only Matters of Fact, that have been verified by a whole Society; compoſed of Men which have Eyes to ſee theſe ſorts of things, otherwiſe than the greateſt part of the World, even as they have Hands to ſeek them with more dexterity and ſucceſs;

who ſee well what is, and who are not eaſily to be made to ſee what is not; who ſtudy not ſo much to find out Novelties, as carefully to examine thoſe pretended to be found; and to whom even the Aſſurance of being deceived in any Obſervation, brings no leſs ſatisfaction than a curious and important diſcovery: So much the Love of Certainty prevails in their ſpirit above all other things.

Now this Affection is ſo much the ſtronger, as it is not oppoſed by any other intereſt, ſeeing that the Vain-glory, which the ſucceſs of an ingenious deluſion might have gained by ſurprize, would ſignifie very little being divided amongſt ſo many perſons, who do all contribute to this work: Either by the Propoſitions which every one makes of the Novelty which he diſcovers; or by the Light and Illuſtration which his cenſure gives to the diſcovery's of others, by exammining them, as his are done, with a care which a ſmall Punctilio of Æmulation, never fails to excite amongſt Philoſophers. So that it is very probable, that what ever has undergone ſo ſevere a Tryal is exempt from all mixture of Falſity and Impoſture.

This Exactneſs to advance nothing but what has been verified, is that which has made *Democritus* ſo greatly extol'd amongſt the Ancients, when having collected a great abundance of ſtrange Curioſities, it is reported that in his Collections he marked with his own Seal, thoſe of which he Experimentally knew the Truth, to compoſe a Volume of them, which he intituled the *Book of Choice*. Thus after his Example it is that we deſign that this Collection, be a choice of all that ever has been found and carefully remarkt in the Animals which could be examined.

In this Collection we have particularly inſiſted on that which belongs to the ſtructure of the Parts of Animals, rather than that which concerns their Natures, Nouriſhment, the way of taking them, their Qualities in Phyſick, and the other uſes which are attributed to them; of which all Natural Hiſtorians have compoſed their Volumes, and of which we have ſpoken only Tranſiently, and according to the Occaſion which what we obſerved in our Subjects, afforded us; But this deſign of Deſcribing only the Parts, has been reſtrained to thoſe within; and it is for that Reaſon, that we do call the *Deſcriptions* which we make, *Anatomical*, altho' they do contain a great many things which may be ſeen without Diſſection.

Indeed, our chief Aim being to report, and collect all the Remarks, which we have made on the different particularities of the inſide of Animals, we could not omit the other Obſervations which belong to the exteriour Form, by reaſon of the Relation that all the parts have each to other. But we ſtay not long on things which do not directly appertain to this *Anatomical* Knowledg, becauſe that there is little leſs, but this exact Deſcription of the internal Parts, wanting to *Natural Hiſtory*. We could not (likewiſe) ſometimes avoid digreſſing out of that ſtrait and narrow Road, which we propoſed to follow; and we have thought our ſelves obliged to enter into the Controverſies which are amongſt Naturaliſts, touching the difficulty that there is of knowing, whither ſome of the Animals which we have, are preciſely thoſe which the Antients have ſpoken of; becauſe that the Deſcriptions of theſe Authors are generally very Ambiguous, and agree not ſufficiently amongſt themſelves, to take away the doubts which may ariſe, that the Animals to which they do give the ſame Name, are not ſometimes different; and that thoſe alſo which the Vulgar call otherwiſe than they have, are not the ſame which they have ſpoken of. The particular and new Remarks which we have made, have ingaged us to this Examination: But we pretend not to put a value on our Conjectures, farther than particular Facts can prove them; being ready to retract, when it ſhall happen, that a great number of contrary Obſervations ſhall demonſtrate to us, that theſe firſt were made upon Subjects, the formation of which, was extraordinary; and conſequently inſufficient and incapable, of eſtabliſhing a general Concluſion: But we have thought, that things of this Nature might be put into *Memoires*, which are as it were *Magazines*, wherein are lockt up all ſorts of things, to be made uſe of in time of need.

Now altho' we ſtick only to this Deſcription, and this lively Painting, which we have endeavoured to perform ſimply, and without any Ornament, and have no other intention, than to diſcover things ſuch as we have found them, and even as in a Glaſs, which adds nothing of its own, and which repreſents onely what has been preſented to it: Yet we have not forborn ſometimes to add Reflexions, when we have thought it neceſſary, upon particularities that deſerved it; and that onely as a Sample, and firſt Fruits which might be gathered, when by the collecting of all the

Obſervations which may be made, this Work will be ſufficient to afford Matter enough, for the compoſing an intire and compleat Body thereof. So that it is to be underſtood, that we deſign not that the Reflexions which are here preparatorily made, do paſs for deciſions, but only for Eſſays of what may be expected from this ſort of Work.

There are ſome who have found fault with that great Work of *Ariſtotle*'s *Hiſtory* of Animals, becauſe they fancy that this Author diſcourſes therein, more like a Philoſopher than an Hiſtorian; but this is not the Opinion of the moſt part of the Curious, who think that he has too much confined himſelf to the Character of a bare Relation; and that it is a great damage that he has not more explain'd himſelf on all the things which he could diſcover, by the aſſiſtance of the admirable Light which he had in all ſorts of Sciences: And the Opinion of *Hierocles* is very probable, who ſays that the ten Books which we have of *Ariſtotle*'s Hiſtory, are only an Abridgment which *Ariſtophanes Bizantinus* made of the Fifty Volumes that *Pliny* has ſpoken of, in which was contain'd all that which may belong to the intire and perfect knowledg of Animals.

But as it is impoſſible to Philoſophize without making ſome general Propoſitions, which ought to be grounded on the knowledg of all particular things, whereof Univerſal Notions are compoſed; and that we ſtill have a long time to work, before we can be inſtructed in all the particulars neceſſary for this End: We believe that there will not be overmuch reliance on the Reaſons, which we have intermixt amongſt our Experiments, and that it will eaſily be judged, that we pretend only to anſwer ſome Matters of Fact which we advance, and that theſe Facts are the ſole Powers whereby we would prevail againſt the Authority of the great Perſons which have writ before us; ſeeing that ſpeaking of them with all the Reſpect which they deſerve, we do own that the defects which are ſeen in their Works, are there only, becauſe it is impoſſible to find any thing which has acquired the utmoſt perfection: Altho' theſe Works do nearly enough approach it to be inimitable, and to make all thoſe who are rational and intelligent, to have a ſingular Veneration for the Excellent *Genius*'s which have produced them: For we do think we render a greater Honour to the Merit of the Antients, by Demonſtrating that we have diſcovered ſome ſmall ſlight Errors in their Works, than if after the manner of thoſe who di-

diſtruſt their own underſtanding, and never ground the Judgment which they do make of the value of any thing but on Prejudices; we ſhould eſteem them only, becauſe we thought they were done by great Perſonages, and not by reaſon of the Knowledg which we have of what they have done well or ill: Becauſe, that as the greateſt *Encomium*, which a hundred blind Perſons might give to a Beauty, would not be ſo advantagious, as the meaneſt of a ſingle Perſon who had good Eyes: The approbation likewiſe, which a general conſent of all ages has given to the Works of great Perſonages, could not be well grounded, if it did not appear that it had been done with Diſcretion, and conſequently with Examination, by which it has been verified, that whatever it may have defective is nothing, in compariſon of the vaſt Number of curious and excellent things which are there found.

We ſuppoſe, that ſuch as are capable of theſe Reflections, will not have the Malignity to make uſe of the Authority given to a great number of thoſe, who being incapable thereof, would have us like themſelves, retain a blind Veneration for the Works and Sentiments of the Antients; and we do hope, that rational Men will not be ſo injurious, as to render odious the Liberty which we have aſſumed, of ſaying that our Deſcriptions are exact, becauſe that we propoſe nothing but what we have ſeen; and that we do pretend, that they are exacter than thoſe of the Ancients; which are made for the moſt part on the Reports of others: Seeing that we do not impertinently affect to marke the Errors of theſe great Men, and that we do only advertiſe the Reader, that our Obſervations agree not with theirs. For we think not that this compariſon of our Diligence with their Remiſſneſs, a vain Oſtentation and utterly unprofitable; ſeeing that it may contribute to an inſtruction more preciſe, and which better imprints the Idea's of things, when their true Deſcription is diſtinguiſhed, and marked by the oppoſition of that which is falſe: Or however this demonſtrates, ſuppoſing both the contrary Obſervations to be true, that one may conclude, that in conſideration of the Particularities wherein we differ, Nature is variable and inconſtant.

For which Reaſon, we have choſen a particular way of making our Deſcriptions. For whereas the Ancients and generality of the Moderns, do handle the Doctrine of Animals, like that of the Sciences, always ſpeaking in general, we only expoſe things as ſingular;

lar; and inſtead of affirming, for inſtance, that the *Bear* has Fifty-two *Kidnyes* on each ſide, we ſay only that a *Bear* which we diſſected had the *Conformation* thereof very *particular*; and in deſcribeing it, if we teſtifie our Admiration that no one has made this remark, and that even thoſe who have made the Anatomy of theſe Animals are ſilent therein; it is becauſe that we ſuppoſe that Nature, who rarely ſports her ſelf in the conformation of the Principal Parts, has formed the *Kidnyes* of other *Bears* after the ſame Faſhion, as we have found them in our *Subject.*

In the Deſcription of rare Animals, which do come from Forreign Countries, we have have been particularly careful to repreſent their external Form exactly, and to denote the ſize and proportion of all the Parts ſeen without the Diſſection: Becauſe theſe are things almoſt as little known, as what is within the Body. The familiar Animals are otherwiſe deſcribed: For the bigneſs, form, and ſituation of their parts, as well exterior as interior are compared to thoſe of Man, whom we do eſtabliſh as the Rule of the Proportion of all the Animals: Not that we do think that he is abſolutely better proportioned than the moſt deformed Beaſt: Becauſe that the Perfection of every thing depends upon the Relation it has to the End for which it is made: And it is true, that the Ears of an *Aſſe*, and the Snout of a *Hog*, are parts as admirably well proportioned, for the uſes to which Nature has deſigned them, as all thoſe of Man's Viſage are, to give him the Majeſty and Dignity of the Lord of all the Creatures: But it is neceſſary to agree of ſome one Meaſure and *Module*, as is obſerved in *Architecture*: And conſidering the whole Univerſe as a great and ſtatley Edifice, which has ſeveral Apartments of a different ſtructure, the proportions of the moſt Noble are pitcht upon for the Regulating all the reſt. So that when it is ſaid, for Example that a *Dog* has a long head, little ſtomack, and the legg all of one thickneſs, it is onely in comparing theſe parts with thoſe which are found of the ſame kind in Man. We do likewiſe deſcribe all the parts of Man's Body, altho' there are not ſo many new things to ſpeak of, as thoſe of other Animals; it being very difficult to add any thing to the Ancients and Moderns, who have handled this Matter with all the exactneſs immaginable, and with a ſucceſs comparable to the Grandure and Dignity of the Subject. To a great number of particular Obſervations which we have made, we added all the other Remarks which are common to us with other Authors, and which we do not give for new; but only as being in ſome ſort conſiderable, by reaſon of the certainty and credit, which the Teſtimonies of ſo many Perſons who have contributed to theſe Deſcriptions, may add to the Facts which we declare.

This ſo preciſe exactneſs in relating all the particulars which we obſerve, is qualified with a like care to draw well the Figures, as well of the intire Animals, as of their external Parts, and of all thoſe which are inwardly concealed. Theſe Parts having been conſidered, and examined with Eyes aſſiſted with *Microſcopes*, when need required, were inſtantly deſigned by one of thoſe upon whom the Company had impoſed the charge of making the Deſcriptions; and they were not graved, till all thoſe which were preſent at the Diſſections found that they were wholly conformable to what they had ſeen. It was thought that it was a thing very advantagious for the perfection of theſe Figures to be done by a Hand which was guided by other ſciences than thoſe of Painting, which are not alone ſufficient, becauſe that in this the Importance is not ſo much to repreſent well what is ſeen, as to ſee well what ſhould be repreſented.

Our *Memoires* being thus compoſed it is to be hoped that they will afford Matter for a *Natural Hiſtory*, which will not be unworthy of the Greateſt *King* that ever has been; and that if in this to equal *Alexander*, as he equals and ſurpaſſes him in all other things, he wants ſo great a Perſon as *Ariſtotle*, the care which His *Majeſty* has taken to ſupply this Defect, by the Number of Perſons which he has choſen for this Employ, and by the Order obſerved to perform the things with an abſolute exactneſs, will make this Work, which was undertaken by his Command, not inferior perhaps, to that which has been done for *Alexander*.

The

The Explication of the Figure of the LYON.

IN the lower Figure he is repreſented alive, his Head turned on one ſide, as he ſometimes carries it; notwithſtanding the ſtifneſs of his Neck. The Claws tho' very great are indiſcernable, being covered with hair, which is very long at the extremity of the Paws. The Form which the Tail has under the Hair is not ſeen, by reaſon of the different length of the Hair, which makes it to appear of equal thickneſs from the beginning to the end.

In the Parts which the Diſſection diſcovers.

A. *The Creſt of the* Cranium.
B B. *The* Zygoma.
C c. *The great and little* Canini.
d. *The* Inciſores.
E. *The* Apophyſis Coronoides *of the lower Jaw.*
F F F. *The* Molares.
G. *The extremity of the* Radius.
H. *The extremity of the* Cubitus.
I I. *The Bones of the* Carpus.
1 1 1 1. *The four Bones of the* Metacarpus.
2 2 2 2. *The four Bones of the firſt* Phalanx *of the Toes.*
3 3 3 3. *The four Bones of the ſecond* Phalanx.
OO. *The laſt Bones of the Toes. We have repreſented one a part, and out of its articulation, which with the two others marked* 2, 3, *which are likewiſe ſeparated from the reſt of the Paw, makes one of the Toes. You may obſerve the bending which the Bone marked* 3, *has at its extremity, which makes a* Condylus *or Protuberance, to make room for the laſt Bone, which is articulated to it, to bend upwards.*
K. *A part of the Skin of the Tongue, ſeen with a* Microſcope.
L L. *Little Eminencies, which are near the root of every one of the Points which are upon the Tongue.*
M M M. *The Points which make the Tongue rough.*
N. *One of the Points Separated from the Skin, to ſhew its cavity.*
O. *The Gall-Bladder.*
P. *The* Ductus Cholidochus.
Q. *The Bladder.*
R R. *The* Proſtatæ.
S S. *The Ligaments, which joyned with the* Urethra *do compoſe the Body of the* Penis.
T. *The beginning of the* Urethra.
V. *The* Balanus.
X. *The* Humor Cryſtallinus, *which was ſpoilt.*
Y. *The other* Cryſtallinus *which was found.*
Γ. *The Tongue.*
Δ. *The* Cartilago Thyroides *of the* Larynx.
Θ. *The* Cartilago Cricoides.
Λ. *The* Cartilago Arythenoides.
Ξ. *The* Glottis.
Σ. *The* Epiglottis.
Φ. *The loweſt part of the Stomack.*
Υ. *The* Pylorus.
α. *The* Oeſophagus.
β β. *The* Aſpera Arteria.
γ. *The left Auricle of the Heart.*
δ. *The Heart.*
ζ. *The right ſubclavian Artery.*
η. *The right* Carotides.
Θ. *The left* Carotides.
κ. *The left ſubclavian Artery.*
λ λ. *Part of the Diaphragme.*
μ. *The ſuperiour Orifice of the Stomach.*
ν ξ. *two protuberancies which were at the fore-part of the Stomach.*
1, 2, 3, 4, 5, 6, 7, 8, *The Lobes of the Lungs.*

THE

THE ANATOMICAL DESCRIPTION OF A LYON.

BEfore the opening of our Lion, we carefully examined all its external Parts, according to the Method which we propoſed to our ſelves, to obſerve in all the Deſcriptions of the other Animals. We found that the greatneſs of the Head, which is remarkable in this Animal, conſiſted chiefly in the extraordinary abundance of the Fleſh which covered it, and in the greatneſs of the Bones which compoſe the Jaws. That the *Breaſt* likewiſe, which appeared large, was only by reaſon of the long and thick Hair which incompaſſed it, the *Sternum* being compreſſed, and much more pointed, than it is in moſt *Horſes* and *Dogs*: And that by the ſame reaſon, the *Tail* ſeemed not to be of equal thickneſs from one end to the other; but by reaſon of the inequality of the Hair wherewith it was invironed, which was ſhorter towards the beginning, where the Fleſh and Bones are thicker, and which grew longer as theſe parts grow leſſer and leſſer, towards the end. And that this long Hair which is about the Neck and Breaſt, did differ from that of the reſt of the Body only in its length, having nothing reſembling Man's Hair.

The *Claws* had no caſes, as *Pliny* reports they have, to keep them from being dulled by their walking; but it appears rather, that theſe Animals, as *Plutarch* and *Solinus* obſerve, do provide for that by retracting *them* between their Toes, by the means of the *particular Articulation* of the laſt Joynt, which was ſuch, that the laſt Bone ſave one, by bending it ſelf outwards, gives place to the laſt which is articulated to it, and to which the Claw is faſtened to bend it ſelf upwards and ſide-ways, more eaſily than downwards; being drawn upwards by the means of a tendinous Ligament, which faſtens together the two laſt Bones in their ſuperiour and external part only; and which ſuffering a violent diſtention when the Toe is bent inwards, extends this laſt Articulation, as ſoon as the *Muſculi flexores* come to ſlacken, and ſtrengthens the Action of the *Muſculi xetenſores:* So that the Bone which is at the end of every Toe, being almoſt continually bent upward, it is not the end of the Toes which reſts upon the ground, but the Node of the Articulation of the two laſt Bones; and thus in walking, the Claws remain elevated, and retracted between the Toe, to witt, all thoſe of the right Paws, towards the right ſide of every Toe, and all thoſe of the left Paws, towards the left ſide; The *bending* of the *Toes* to walk being cauſed only by the *Tendons* of the ſublimer Muſcles and thoſe of the lower Muſcle never moving but when it is neceſſary to extend the Claws, which do proceed out of the Toes, when the laſt Joynt is bent downwards. This admirable Structure is not found in the great Toe, whoſe laſt joynt bends only downwards, becauſe that this Toe reſt's not on the ground being ſhorter than the reſt, and having but two Bones as is uſual.

It had fourteen *Teeth* in each Jaw, *viz.* four *Inciſores*, four *Canini*, and ſix *Molares*. The *Inciſores* were little, and the *Canini* very uneven, having two *great* and two *ſmall* ones. The *great ones* which were an inch and half long, like the Tusks of a *Boar*, are thoſe alone which *Ariſtotle* takes for *Canini*: But each of theſe great *Canini* was accompanied with another little one, which was at the ſide of the *Inciſores*, and which left in the upper Jaw, between it and the great one, as much void ſpace on each ſide, as was neceſſary to lodg and inſert the *hook* of the great *Caninus* of the inferior Jaw, in which there was likewiſe a ſpace between the great *Caninus* and the firſt of the *Molares* deſigned to lodge the great *Caninus* of the upper Jaw, but which was much larger, to the end that the lower Jaw might be advanced forward upon occaſion. The *Molares* were likewiſe very uneven, eſpecially in the upper Jaw, where that which ſtood next the *Caninus* was as ſmall as the *Inciſores*: The other *Molares* were very large, having three unequal points, which repreſented as it were the flower de Lys.

The *Neck* was very ſtiffe, as Authors have remark't. But the Diſſection has demonſtrated to us in our *Lyon*, that this proceeded not, as *Ariſtotle* and *Ælian* have reported, from its having only one Bone, but rather for that the ſpinous proceſſes of the *Vertebræ* of the Neck were very long, and bound with Ligaments ſo ſtrong and hard, that it ſeem'd compoſed of one ſingle Bone: *Scaliger* ſays that he had obſerved the ſame thing in the Diſſection of two *Lyons*: And it is probable that *Ariſtotle* has ſo underſtood it, when in his *Phyſiognomie* ſhe ſay's, that the Body of the *Lyon* is remarkable for the greatneſs and firmneſs of its Joynts.

The *Tongue* was rough and *covered* with a great many *ſharp points*, of a Subſtance hard, and like to that of the Nails of *Catts*, whoſe bigneſs they alſo had: Theſe points being hollow at their Baſis, and crooked towards the throat. They were almoſt two lines in length, and towards their Baſis had little round Eminencies, made of the fleſhy skin of the *Tongue*.

The *Eyes* were clear and brisk after death, and through the *Foramen* of the *Vuea* was ſeen the bottom of the *Choroides*, which was as it were gilt. The *Tunica Conjunctiva* was black. It is probable that the reaſon of ſaying, that *Lyons do Sleep with their Eyes open* is that without ſhutting the *Eye-lidds*, they can cover them with a thick and black Membrane lay'd towards the great *Canthus* which raiſing and ſtretching out it ſelf towards the leſſer, can extend it ſelf over all the *Cornea*, as is obſerved in *Birds*, and eſpecially in *Catts*, which have ſo great a *conformity* with the *Lion*, that we have found that there was ſome ground for the fable of the *Alcoran*, which ſays that the *Cat* was firſt born in the Ark by the ſneezing of the *Lion*. For the *particular ſtructure* of the *Paws, Teeth, Eyes* and *Tongue*; which we have obſerved in the *Lion*, is found to be common with the *Catt*; And the internal parts of theſe two Animals have the ſame conformity, altho' *Albertus* affirms the contrary.

At the *firſt opening*, the *Skin* ſeemed not to us extraordinary hard, nor impenetrable, as *Cardan* reports; but it was found ſtrongly connected by a number of hard and nervous Fibres which proceeded from the *Muſcles* and penetrated the *Panniculus carnoſus*.

The *Oeſophagus* was not ſo large that the *Lion* could ſwallow, as ſome Authors tell us, the members of Animals all intire; for it exceeded not an inch and half in breadth, and was drawn together by the *Foramen* of the *Diaphragme* after the uſual manner, being not open and dilated, as it is in moſt *Fiſhes* and *Serpents*, which do eaſily ſwallow whatever enters into their Mouth.

The *Stomack* was eighteen inches long, and ſix broad, ſituated from the top to the bottom, inclineing a little to the right ſide, and riſing towards the *Pylorus*. At the Superiour and Anteriour part there were two unequal Protuberancies.

The *Inteſtines* were not very long, comprehending all together but twenty five foot, the *Colon* eighteen inches, and the *Appendix* of the *Cæcum* three.

The *Pancreas* was like to that of *Catts* and *Dogs*, and the great *Glandules* of the *Meſentery*, which are by *Aſellius* called *Pancreas*, were alſo like to thoſe of theſe *Animals*.

The *Liver* in which we found ſeven lobes as in *Catts*, was of ſo dark a red, that it inclined to a black: It was alſo very ſoft. Its hollow part under the *Gall-bladder* was filled with choller diffuſed into it's Subſtance, and into that of all the Circumjacent parts; which was the ſole Circumſtance that gave us ſome ſuſpition of the cauſe of this Animals death, which we judge to be the Diſeaſe, to which *Pliny* alone ſay's *Lions* are ſubject, and which he calls *Ægritudinem faſtidii*: For whether this be underſtood of the mortal trouble which it conceives of its captivitie, as that Author expreſſes it, or that this ſignifies the diſguſt which kills him for want of eating, it is well known that the retention of the choller may cauſe either.

The G*all-bladder* was ſeven inches long and one and a half broad. Its Structure was very particular, being anfractous towards the *Meatus Cholidochus*, and as it were ſeperated into ſeveral cells: *Catts* have exactly the like.

The *Spleen* was a foot long, two inches broad, and half an inch thick. It was not ſo black as the *Liver*, notwithſtanding that general rule which *Galen* gives of the colour of the *Spleen*, which he ſays is always blacker than the *Liver*, eſpecially in Animals which are of a Temperament hot and dry, and which have ſharp Teeth. So that there is great probability that this blackneſs of the *Liver* was extraordinary in this Subject, and not natural. The *Kidney* was almoſt round, being three inches and a half in length to two and a half in breadth and thickneſs: It weighed ſeven ounces and two drachmes.

The *Parts* of *Generation* had this particular, that the *Vrethra* was not crooked, but quite ſtrait from the *Bladder* to the extremitie of the *Penis*; and that the beginning of the Ligaments, which with the *Vrethra* do compoſe the body of the *Penis*, was very remote from the *Proſtatæ*, which are at the beginning of the neck of the *Bladder*: So that the *Vrethra*, which in all contained eleven inches, extended not, being joyned to theſe Ligaments, the length of three inches and a half: Which made us to doubt of the truth of what *Ariſtotle* ſays concerning the *Phyſiognomie* of the *Lion*, to witt, that he has eminently, and above all other Animals, viſible and apparent ſignes of the ſtrength and perfection of his Sex.

The reaſon of this Structure appears to us to be founded on the extraordinary breadth of the *Os pubis*, along which the *Urethra* muſt deſcend from the *Bladder*, the bottom of which muſt paſs over the *Bones*, to their inferior part, from whence ariſeth theſe Ligaments which do compoſe the *Penis*. This Conformation makes the the *Lion* to piſs backwards, and not by lifting up the *Legg*, like *Doggs*, as *Pliny* ſay's, and that he couples with the *Lioneſs* after the ſame manner as *Camells*, *Hares*, &c.

In opening the *Thorax* it was obſerved, that from all the *Cartilages* of the *Sternum* which had been cut, there came out two or three drops of Blood, which demonſtrated that theſe parts are not ſo ſolid, as that their cavities ſhould be imperceptible, as ſome Authors do think, ſeeing that they are penetrated by ſome Sanguinary Veſſels, as is ſeen in all Animalls when young.

The *Mediaſtinum* was furniſhed with abundance of great veſſels. The Membranes which compoſed it, and which were perforated like a net, were joyned, and left no ſpace but towards the *Diaphragme*, on the right ſide of the *Heart*, where there was a very large and ample cavity. The ſame thing is obſerved in *Catts*.

The *Lungs* were found to have ſix Lobes on the right ſide, and three on the left. All the *Annular cartilages* of the *Aſpera Arteria* made an entire circle, excepting two or three under the *Larynx*, in which beſides their greatneſs, which was four inches in compaſs, there was not more than two lines which were not entire. The breadth of this Organ of the voice ſeem'd to us very capable of making the dreadful noiſe of its Roaring.

The *Ductus lacteus Thoracicus* was very ſmall, and joyned to a long fillet of fat, which was extended to the whole length, and at the ſide of the body of the *Vertebræ*, it was two lines broad.

The *Heart* which was found dry and without water in the *Pericardium*, was in proportion much greater than in any Animal, containing ſix inches in length, and four in breadth towards the Baſis, and ending in a very ſharp point. Its Subſtance appear'd to us very ſoft, before it was opened; but it was diſcovered that this proceeded from its being lean, and hollow, its *Ventricles* being ſo ample, that the left one which deſcended into the *Cuſpis*, left but two lines of thickneſs in the fleſh which covered it at this place; towards the Baſis it had but ſeven, and the *Septum* had almoſt as many. The *Auricles* of the *Heart* were ſo ſmall, that the Right, which is the greateſt, was not half an inch. The Structure of the *Heart* of *Catts* is not ſo particular, for it is more obtuſe at the *Cuſpis* and fleſhy than ordinary. The Proportion of the Branches which the Aſcendent *Aorta* emitts was ſuch, that the *Carotides* contained the ſame thickneſs as the left *Subclavian*; and as the remainder of the Right from whence they do ariſe; which is very conſiderable in reſpect of the ſmallneſs of the *Brain*. The ſame thing is obſerved in *Catts*, excepting that they have a great deal more *Brains*, in proportion to their Bigneſs.

The *Brain* exceeded not two Inches every way. It was included in a

Cranium about half an Inch thick in the thinneſt place, and almoſt an Inch in the Fore-head. The *Crown* was elevated like the *Creſt* of an *Helmet*, to give riſe to the Muſcles of the Temples, which do cover the Two ſides of the *Crown* of the Head, and in the middle of the fore-head do leave that Cavitie, which *Ariſtotle* in his *Phyſiognomy* adjudgeth to be peculiar to *Lions*. Every of theſe Muſcles was five inches in length, four and a half in breadth, two in thickneſs, and Twenty Ounces in Weight. This *Head* thus *Garniſhed* with Fleſh, and *Compoſed* of *Bones* ſo firm in their ſtructure and Subſtance, made us to think that if the *Bear*, according to *Pliny*, has a Head ſo tender and weak that it may be Slain with a ſlight Blow, it is probable that it would be very difficult to ſtun a Lion; and that this was well known to *Theocritus*, who tells *Hercules*, that all that he could do to the *Nemæan* Lion with his Club, was to ſtun him, and that he could not kill him but by Strangleing him with his Hands.

The *Bone* which is found in Brutes between the *Cerebrum* and *Cerebellum* over the *Satura Lambdoides*, was an Inch and a half long, Ten lines broad, and Two thick, of a ſquarer Figure than that which is in the Scull of *Cats*, *Doggs*, &c,

The *Glandula Pinealis* was diaphanous, and ſo ſmall that it exceeded not a line in length, and two Thirds of a line in breadth at its Baſis.

The *Optick Nerves* appeared much thicker after their Conjunction than before: Which proceeded hence that the *Foramina* thro' which they do enter into the *Orbita* are not round, but like a ſlitt; which makes them broader by flattening them. Being paſt thro' the *Foramen* of the *Orbita*, they were extended to the Globe of the Eye, two Inches and a half in length. It was obſerved that the *Cavity* of this *Orbita* was not wholly fenced with a Bone on the inſide, but that there was a hole towards the Temples, between the *Apophyſis* of the *Os Frontis*, and that of the firſt bone of the Jaw, which were not joyned more than in *Cats*, *Doggs*, &c.

The Globe of the *Eye* was ſixteen lines Diameter. The *Cornea* was about the third part of a line in thickneſs at the middle, and grew thicker towards its Circumference; till it came to half a line, after the manner of the glaſſes in Spectacles.

The *Iris* was of that pale colour, which is called *Iſabella*.

The *Tunica Choroides* appeared of a Gold-colour, and which had nothing of that Verdure, which moſt Authors do give to the *Eyes* of the *Lion*. The *Reverſe* of the *Anterior Vuea* in the Place it lyes upon the *Cryſtallinus*, was all Black. The *Cryſtallinus* was found very flat, and its greateſt Convexity, contrary to what is in other Animals, was in its anteriour part; which is alſo obſerved in the *Eyes* of *Catts*. The Figurs of the *Cryſtallinus* was ſuch: that it ſeemed ſhrunk up having a Dent in the ſide, which made the *Cryſtallinus* of the left *Eye*, where this dent was the greateſt, like the Forme of an Heart: But one of theſe *Cryſtallinus's* which began to be ſpoilt by a *Glaucoma*, made us to ſuſpect that this was Præternatural, and particular to our Subject. The *Aqueous Humour* was found very abundant, ſo that it almoſt equal'd the ſixth part of the Vitreous *Humour*. This abundance was Judged to be the cauſe of the clearneſs which remained in the *Eyes* after Death, which are obſcured when the *Cornea* is dryed and contracted for want of this *Humour*, which keep's it extended.

The laſt Obſervation was, that conſidering the Seaſon which was hot and moiſt, when this Diſſection was made, and the diſpoſition to Putrifaction which muſt needs be in the body of an Animal Dead of a Diſeaſe, and which all Authors report to have a breath ſo ſtinking, that it Infects whatever it approaches, to ſuch a degree that other Animals do not touch the remainder of the Fleſh whereof he has eaten; yet there appear'd nothing to us which denoted any extraordinary Corruption, its ſmell being leſs offenſive than that of a *Deer*, which muſt be embowelled ſoon after it is killed: And altho' there were found ſome *Wormes* in its Fleſh the fourth day, it was judged that they were ingender'd of *Flyes*, becauſe that a piece of the *Tongue* wrapt up in Paper was dryed in the ſpace of one night, and was grown very hard without any ſmell. Which made us conclude, that if the *Lion* is ſubject to a *Feaver*, it is not cauſed by the Corruption of Humours, and is only an *Ephemera*, altho' it is ſaid that he has it all his life: This may cauſe a Belief that Choller is a Balſome in the body of Animals which reſiſts Corruption, and which has this effect, that *Lyons*, in whom it is prædominant, do live a long time.

There was likewiſe made another reflection upon the ſmalneſs of the *Brain* of this Animal, of which Natural Hiſtorians do relate ſo many marks of Judgement and Reaſon; and by comparing it with the abundance of that of a *Calfe*, it was judged that the littleneſs of *Brain* is rather the ſign and cauſe of a ſavage and cruel Diſpoſition than a want of Judgment. This conjecture was fortified by an other Obſervation which was made four dayes before upon a *Sea-fox*, where was found hardly any *Brain*, altho' it was thought that the Sagacitie and Subtiltie which it hath, has given it this Name amongſt *Fiſhes*, all the Kinds of which are generally ill provided of *Brain*, ſo that they have little diſpoſition to the Society, and Diſcipline which Terreſtrial Animals are capable of.

THE ANATOMICAL DESCRIPTION OF ANOTHER LYON.

THis *Lyon* was extraordinary large, though very young. It was ſeven Foot and a half long, from the end of the Noſe to the beginning of the Tail, and four Foot and a half high, from the top of the Back to the ground.

Our Obſervations were almoſt the ſame, with thoſe which we have already made on the firſt *Lyon*, but amongſt other things, the ſtraitneſs and narrowneſs of the *Thorax*, which we have already remarkt, ſeem'd to us very conſiderable in this Subject: For in the inſide, from the one ſide to the other in the largeſt place, it exceeded not ſeven Inches, of which the *Heart* took up four, ſo that there remained but three for the *Lungs*, *Pericardium*, *Mediaſtinum*, and Veſſels of the *Heart*. The *Pericardium* was likewiſe without Water, and the *Inteſtines* ſhort in Proportion to the Body, containing but Twenty five Foot in length, which was juſt three times the length of the Body. The *Cryſtallinus* was more convex on the outſide than the inſide.

What we found different is, that the *Liver* which was of ſo dark a *Red* in the firſt *Lyon* that it appeared *Black*, was ſo pale in this that it had a *Feville-morte* Colour.

That the *Annular Cartilages* of the *Larynx*, which were intire in the firſt *Lyon* which nevertheleſs was not Old, were found imperfect in this which was Younger. And we were not able to reſolve whether we ought to atribute to the difference of Age, that which we obſerved in the Paws, becauſe that in thoſe of the Young *Lyon* we found the Skin much leſs hard, and firm then the other, ſo that at the extremity of every Toe of the Young one, it was ſo looſe and flaggie, that it might be made to extend and deſcend to cover half the Nail: Which ſeems to be the caſe of which *Pliny* ſpeaks. But the Truth is that there is no probability that this can preſerve its Nails, as this Author Reports, becauſe that they uſe them only at the Point, which this Skin cover's not.

We likewiſe obſerved ſomthing new, *viz.* That the *Epiploon* which was as great and large as its internal Membrane, and which immediatly touched the *Inteſtines*, did invelope them, and came round even to the *Kidnyes*, having only the upper Membrane looſe, as the Name of theſe Membranes ſignifies. We farther remarked that their Subſtance was not properly a continued Membrane, but pierced by the light, and like a Texture of very fine Fibres makeing a *Gauze*.

That the *Kidney*, which was four inches long and two and a half broad was ſprinkled on its External Superficies, with a great many Veſſells covered with the Proper Membrane of the *Kidney*.

That the *Lungs* were ſpoilt, dry, pale, and full of Knobs. That in the *Eye*, the *Iris* was Viſiblly plaited with ſome circular wrinkles, which were the effect of the dilatation in the *Pupilla*, happened by the conſtriction of the Membrane which made the *Iris*. This folding is a thing which is commonly ſuppoſed, but which is not perceived without difficulty: And it was ſo much the more ſtrange in this Subject, that the *Aqueous Humour* being very abundant, this Membrane was not Subject to contract by dryneſs. The *Vitreous Humour* was almoſt as fluid as the *Aqueous*. The *Tapetum* of the *Vuea* was Gilded through the middle as in the other *Lyon*, but it had a Verdure at the Extremities, which we found not in the other, although we thought it was to be there, by Reaſon that the Ancients did call the Eyes of *Lyons* χαρωποὺς that is to ſay, full of Ornaments, becauſe that they found that green Eyes were moſt Beautiful.

The *Retina* was White and Opake enough, to make one think that it would hinder the reception of the Species, if it is True that they do paſs farther.

The place where the Sight is commonly made, was croſſed by a Veſſel filled with Bloud, which paſſed alſo into the *Optick Nerves*, where it made a Cavitie, and ſeem'd to form that *Pore* or *Ductus*, with which ſome Authors do think, that the *Optick Nerves* were pierced, to give paſſage to the Spirits which are received into the *Brain*.

The Obſervation of the Veſſels which are Viſible and in great abundance on the *Superficies* of the *Parenchyma* of the *Kidney*, which is a thing extraordinary, affords us Matter for Two Reflexions; the firſt of which is, That theſe Veſſels, which are Branches of the Truncks of the *Arteriæ* and *Venæ Emulgentes*, do eaſily diſcover to the Eye, a Truth which we have already found in ſome humane Subjects, by the injection of Milk into the *Vaſa Emulgentia*, after the having taken from the *Kidney* its proper Membrane. This Truth is that the Branches of the *Emulgents* do not terminate in the Middle of the *Kidneys*, as *Higmorus*, following *Vaſalius*, has thought; But that they are carryed to the external Superficies: For the ſeparation of the *Urine* which muſt be done by *Filtration*, requires that the Blood be carryed thro' the *Arteries* as far as is poſſible, to the end that it there find a greater Thickneſs of the *Parenchyma* of the *Kidneys* to penetrate, and conſequently more capable of making a more perfect Filtration.

The other reflection is, that thoſe Veſſels, which are not generally viſible in the *Kidney*, whoſe Subſtance appears Solid and Homogeneous, towards its external Superficies, which was ſmooth and even, were found very apparent in this Subject. And we thought it probable that this happened by ſome diſtemper, and was Præternatural in this Animal: Either by an Inflammation, or Obſtruction, which had cauſed theſe Veſſels inſenſibly to dilate; This being eaſie in a young Animal, where the parts not yet hardened, are more eaſie to dilate, and the Humours being more agitated are more capable of effecting this dilatation. *Gliſſon* who has obſerved that oftentimes the Branches of ſome Veſſels are bigger than the very Trunck which produces them, ſays that this may be cauſed by a diſtemper: And experience daily demonſtrates by the Pulſation which happens in Inflamations, by the *Glandes* which appear in the *Scrofula*, and by the Veins which diſcover themſelves in the *Eyes* by the *Opthalmia*, that there is a great many things which a Diſtemper renders viſible and ſenſible, by augmenting them, or changing their Nature, and making them to become hard and denſe, from ſoft and rare as they were. Which we have obſerved in the *Glandes* which in ſome *Gazellas*, or *Antelopes*, have ſeemed to make the *Parenchyma* of their Liver, which appeared not in others.

We vainly ſought in the Stomach and Lungs of our *Lyon*, ſome Marks of the cauſe of its Death, which was told us happeened after the voiding a great deal of Blood thro' the Throat. But we judged by ſeveral Circumſtances, which have been related, that a Surfeit extraordinary and inſupportable to an Animal otherwiſe weakened, had made him ſick: For we know that ſometime before his Death, he was ſeveral months without going out of his Den, and that it was hard to make him Eat. That for this reaſon ſome Remedies were preſcribed to him, and amongſt others the Eating only the Fleſh of young Animals, and thoſe alive. And that thoſe which look't to the Beaſts of the Park of *Vincennes*, to make this Food more delicate did uſe a method very extraordinary; which was, they flead Lambs alive, and thus they made him to Eat ſeveral; which at the firſt revived him, by createing him an Appetite, and making him brisk. But it is probable that this Food ingendered too much Blood, and which was too ſubtile for an Animal to whom Nature had not given the induſtry of fleaing thoſe which he Eat: It being credible that the Hair, Wooll, Feathers, and Scales which all Animals of Prey do Swallow, are a ſeaſoning, and neceſſary Corrective, to prevent their greedineſs from filling them with a too Succuleut Food.

The Explanation of the Figure of the LYONNESS.

THe Poſture is ſuch, that it is eaſie to Remark what is moſt Particular in this *Lyonneſs*. The Head is ſide-wayes, the better to demonſtrate the length of her Chops, which was not ſhort and well-ſet like the *Lyons*. It do's likewiſe more diſtinctly ſhew the ſmallneſs of the Neck, which made the Head to be ſhrunk between the Shoulders.

In the Parts which the Diſſection diſcovers.

A. *The* Pylorus.
B. *The bottom of Stomach ſeparated from the reſt, and making as it were an other* Ventricle, *ſuch as is in Animals which chew the Cud.*
C C. *The* Vena Gaſtrica.
D. *The Spleen.*
E E. *The ſeveral Eminencies towards the Baſis of the Heart, compoſed of a hard and tenacious Subſtance, which did not reſemble Fat.*
F. *The Trunk of the* Vena Cava.
G G. *The Trunck of the great Arterie.*
H H. *The* Vaſa Spermatica præparantia.
I I. *The* Teſticles.
K K. *Two Appendices, which appear to be the Fringes of the* Tuba *of the* Matrix.
L. *The* Matrix.
M M. *The* Cornua Uteri.
N. *The Neck of the* Matrix.
O. *The Bladder.*
P P. *The round Ligaments of the* Matrix.
Q. *The* Membrane *which compoſes the* Iris, *making ſeveral circular foulds.*
R. *The place of the* Tunica Conjunctiva, *which is white.*
S. *The place of the* Tunica Conjunctiva, *which is black.*
T. *The* Membrane *which makes the inward Eye-lid.*
V V. *The Claw.*
X X X. *The laſt Bone, to which the Claw is faſtened.*
Y. *A* Cartilagineous *and* Ligamentous *Subſtance, which is between the Bone and the Claw, and which fills the ſpace which is between both.*
a b c. *The* Matrix *of a Woman, in which,* a, *repreſents the* Fundus Uteri. b c, *and* b c. *The Cavity which was in each of the Horns.*

THE

THE ANATOMICAL DESCRIPTION OF A LYONNESS.

BEſides the particular Character of the Sex of the *Lionneſs*, which is to have no long Hair about the Neck, there are obſerved ſeveral others, which are, that ſhe has a longer Noſe, a Head flatter at top, and Claws leſſer than the *Lyon*.

This *Lyonneſs* was three foot high from the end of the fore Claws, to the ridge of the Back. She was about five foot long, from the extremity of the Noſe to the beginning of the Tail, which was two foot and a half long.

The Claws which were at the end, and divided into ſeveral *Fibres* like thoſe of *Lyons*, have been obſerved in this Subject with more care and exactneſs than in the others. It is obſerved that they are compoſed of a *Fibrous* and very compact Subſtance;in reſpect of each *Fibre*,but that theſe *Fibres* are eaſily ſeparable one from the other; which happens, as it is eaſie to Judge, for want of the Moiſture which ſhould join, and glue them together; even as it is ſeen in *Fibrous* Wood, which cleaves not ſo eaſily before it is dry. Indeed this *Lyonneſs*,which was extraordinary lean, had Claws much eaſier to ſhoot out than the other *Lyons* which were younger and fatter. Thus the Root of the Claws, and the particular manner whereby we have found them faſtened to the Bones of the ends of the Paws, has ſeemed to us to be principally to ſupply the humour which is neceſſary to theſe parts.For the Claw was not immediately faſtened to the Bone by its whole Root: But there was a part thereof *viz.*the inſide which was hollow,which was not knitt to the bone.This inſide was filled with a competent ſubſtance between the *Cartilage* and ligament. This manner of connexion and faſtening of theſe *Claws* ſeem'd to us to afford what ever is requiſite to their uſe: For if all the Fibres, whereof theſe Claws are compoſed, had taken riſe immediately from the Bone, they could not attract humidity enough to make that connection, which renders the Claws ſolid: And if they had been all faſtened to the Bone by means of the *Ligaments*, they would not have been ſo ſtrongly joyned, as when they are ſoddered without any thing between.

The Conformation of the Stomach was particular, and very different in this Subject, from that which we have found in other *Lyons* which we have diſſected, where the Stomach was like to that of *Doggs* and *Catts*, having an ample and large *Fundus* towards the ſuperiour *Oriſice*,which alwayes grew leſſer and leſſer towards the *Pylorus*; but this had the bottom parted in two in a manner like Animals which chew the Cud. This particular form of the *Ventricle* was found only in one of the four Animals of this kind which we Diſſected, *viz.* two *Lyons* and two *Lyoneſſes*: For in the two *Lyons*, and the other *Lyoneſs*, the Stomach was like that of *Doggs*. It is very true that the Stomach of the firſt *Lyon* had two *Protuberancies* in its upper part; but this was not conſiderable nor comparable to the diviſion which made this Stomach double, and ſeparated into two Cavities.

The *Inteſtines* contained in all twenty two foot four inches in length; the *Rectum* had but four inches, and the *Colon* two foot.

The *Colon* had no little cells, but only a ſtraiter part, which divided it as it were into two parts, one of which was a little longer than the other. The *Cæcum* was two inches long, and its *Fundus* upwards, and *Orifice* downwards. The *Pancreas* reſembled that of *Doggs*.

The *Meſentery* was covered with livid Glands about the bigneſs of a Pea, all of an oval Figure. The *Veſſels* were very apparent, and greatly dilated, and eſpecially the *Veins*. There was very diſtinctly ſeen the *Venæ Lacteæ*, divided in different Branches, by which the Trunks were eaſily carryed to the *Pancreas Aſſellii*.

The *Peluis* of the Kidneys was filled with a reddiſh Glare, which might have cauſed a reflux of Seroſſity, of which there was found a great deal in the lower *Venter* and *Thorax*.

The *Bladder* was ſo ſmall, that tho' it was extended as much as it was poſſible by filling it with Air, it was not bigger than one of the Kidnys. *Ariſtotle* and *Ælian* do ſay *that* Lyons *do ſeldome drink*. And *Albertus* Remarks, *that* Lyoneſſes *do not long ſuckle their Whelps, for want of that abundance of moiſture, which is neceſſary to the generation of Milk.*

The *Liver* had ſeven lobes, ſix great and one ſmall one. One of the largeſt which are placed on the right ſide, was ſplit in two, and dilated as it were to make room for the right Kidney, which was higher than the left, as is uſually in Brutes. The *Gall-bladder* was *Anfractuous*, and formed like ſeveral *Protuberances*, as in the three other Subjects.

The *Spleen* was long, and like a Creſcent. The branches of the *Vas breve*, which faſtened it to the bottom of the *Ventricle*, were larger and more numerous than ordinary.

The *Uterus* was divided into two long *Cornua* as in *Doggs*. Theſe *Cornua* were tyed and faſtened by large Ligaments. At their extremity, adjoyning to and underneath the *Teſticles*, there were ſome *Appendices* of an irregular Form, and as it were torn at the end, which were thought to be the parts which modern *Anotimiſts* do call the *Fringes* of the *Tuba Uteri* in Women: Which ſeems to juſtifie and clear the Antients from an Errour whereof they were accuſed. For this demonſtrates that they had ſome reaſon to think that the *Cornua Uteri* in Brutes are the ſame thing with that called the *Tuba* in Women. For tho' the *Cornua* of Brutes be a hollow body, in which the Conception and Nouriſhment of their Young ones uſe to be made, and that the *Tuba* of Women appears ſolid and without Cavity, ſo that it is proper to receive the Seed, and make the *Tranſcolation* into the *Fundus Uteri*, by poſſeſſing the place of the *Proſtatæ*, according to the opinion of *Gallen*; and that the Conception be generally made in the *Fundus Uteri*; yet it is very true to ſay that the ſtructure and uſe of the *Tuba* in Women, and the *Cornua* in Brutes, have nothing eſſentially different; ſeeing that as there are ſome Examples of the Conception made in the *Tuba*, we have ſome Obſervations which do manifeſt to us, that this *Tuba* has ſometimes alſo an evident Cavity. We have here put the Figure of the *Uterus* of a Woman, in which we found two apparent Cavities, which made ſome windings eight Lines long, and near two broad at their beginning, which from the *Fundus Uteri* did Penetrate into the *Tuba*.

At the end of each of the *Cornua*, a little below the *Teſticle*, there was a long Body, of a Nervous Subſtance, which was taken for the *Ligamenta Teretia*: For it deſcended into the *Groyne*, and was there dilated like a *Gooſe*'s Foot as in Women. Its original was only different in this, that in Women theſe Ligaments proceeded from the very Body of the *Uterus*, at the place where the *Tuba* began, a good diſtance from the *Teſticle*. *Soranus* Writes, that he had ſeen in a Woman this round Ligament, which he calls the *Cremaſter* of the *Teſticle* of Women, which was faſtened near the *Teſticle*, even as we have Obſerved in our *Lyonneſs*.

The *Mediaſtine* was not pierced like a Net as in the firſt *Lyon*; but its *Membrane* was thick and continued.

The *Lungs* had ſeven Lobes, three of each ſide and one in the middle; Thoſe of the right ſide were larger than thoſe of the left. The whole *Parenchyma* of the *Lungs* was ſcirrhous. The *Vena Coronaria* was very large; but the *Heart* was much leſs than in the two *Lyons* which have been diſſected. The inſide of the left *Ventricle* was ſcirrhous towards the mouth of the *Artery* of the *Lungs*; and it ſeemed that the *Lungs* had communicated this Diſtemper to the Heart. There were two *Polypus*'s, one in each *Ventricle* of the Heart. All the Baſis of the Heart on the out ſide, was ſirrounded with a ſlimy Subſtance; which formed ſeveral unequal *Protuberancies*, inſtead of the Fat which is commonly found in this place.

The *Tongue* was armed, as in the *Lyons*, with great points like Claws; they were leſſer, ſofter, and blunter.

The *Ventricles* of the Brain were very large; and the *Cavity* where the *Falx* enters, and which divides the *Cerebrum* in two, was likewiſe very deep, containing ten Lines. The *Glandula Pinealis* was exceeding ſmall, not exceeding a Line.

The *Chriſtalline Humour* like as in *Lyons*, was more convex before than behind; which was not found in the other *Lyonneſs*, where it was flat and more convex behind. The *Membrane*, which is put into the bottom of the Eye, and laid on the *Choroides*, which we call the *Tapetum*, was of an *Iſabella* Colour, intermixt with a briſk *Greeniſh Blew*. It was eaſily ſeparable from the *Choroides*, which remained intire with its ordinary thickneſs, after that we had taken away the *Membrane* which forms this *Tapetum*.

The *Optick Nerve* was near the *Axis* of the Eye. In it's middle there was ſeen to appear a *Foramen*, which diſappear'd when the whole *Retina* was layd on one ſide, and that it was not equally extended about the *Optick Nerve* on the Concavitie of the *Choroides*.

The Explication of the Figure of the CAMELION.

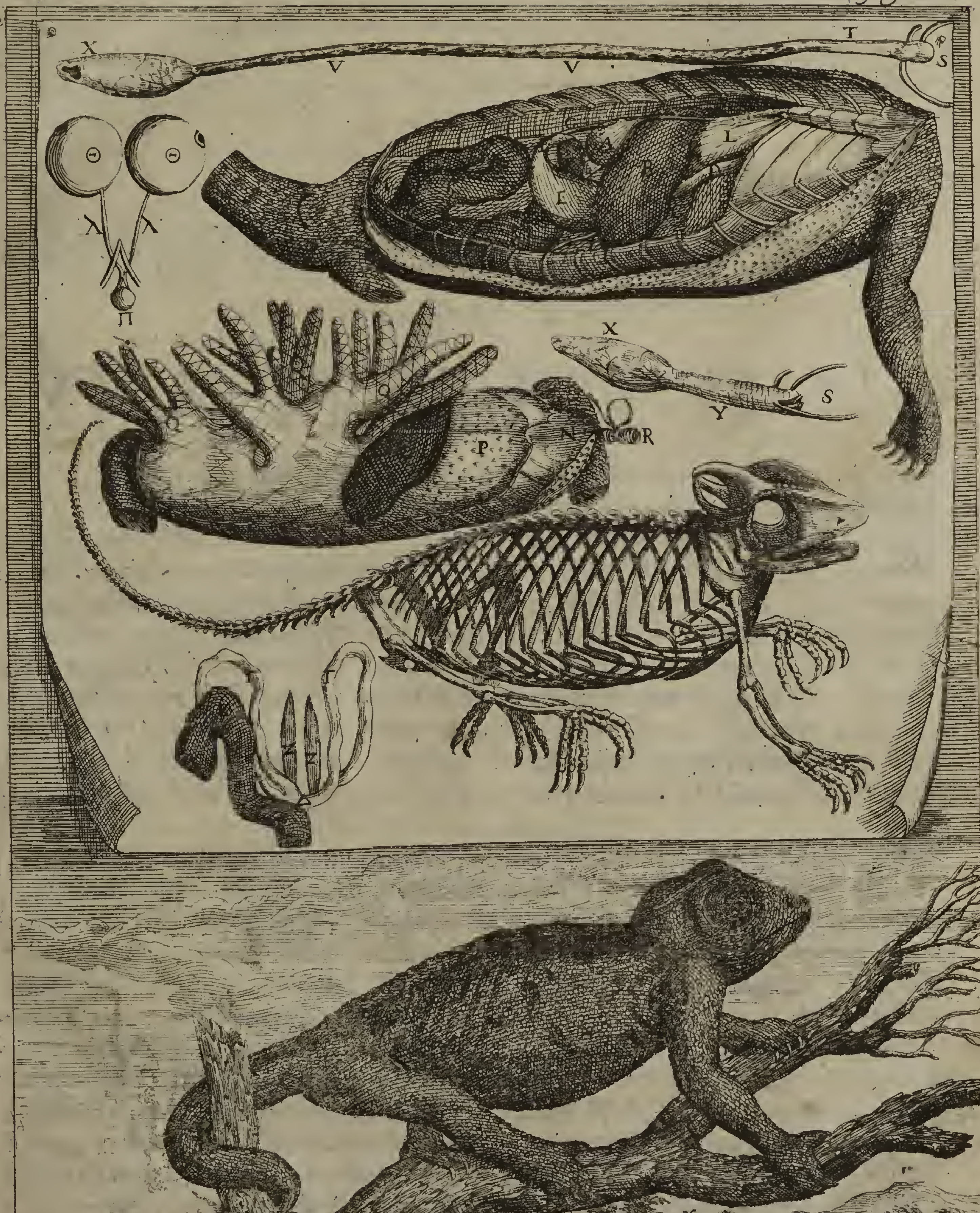
IT is repreſented alive, perched on a Tree ſomewhat crooked towards the ſide which it aſcends, to diſcover as much as is poſſible, the top of the Head, and bottom of the Belly.

In The Parts which the Diſſection diſcovers.

A. *The Gall-Bladder.*
B. *The left Lobe of the Liver.*
C C. *The right.*
D. *The* Oeſophagus.
E. *The* Ventricle.
F. *The* Pylorus.
G. *The* Ductus Cholidocus.
h. *The* Vena-Porta.
I. *The* Vena Cava.
K K K. *The* Inteſtins.
L M. *A* Membrane *which held all theſe Parts linkt together and ſuſpended.*
N. *The firſt-Bone of the* Sternum.
O. *The left Lobe of the Liver.*
P. *The upper part of the Lungs blown up, and ſpeckled with red Spots.*
Q Q Q. *The reſt of the Lungs blown up.*
R. *The* Aſpera Arteria *tyed to keep the Lungs blown up.*
S S. *The* Os Hyoides.
T. *The* Cartalaginous *Style, to which the Trunk which ſuſtains the Tongue, is faſtened.*
X X. *The Tongue.*
Y. *The Trunck drawn up.*
Z Z. *The Kidneys.*
Γ Γ. *The* Cornua Uteri.
Δ. *The Neck of the* Uterus.
K K. *The* Inteſtines.
Θ Θ. *The Eyes.*
λ λ. *The* Optick Nerves.
Π. *The Brain.*

We did not think that the Skeleton needed any Explication, by reaſon of the Neatneſs of the Figure, and the exactneſs wherewith it is deſcribed in the Diſcourſe.

The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THE
ANATOMICAL DESCRIPTION
OF A
CAMELION.

There is ſcarce any Animal more Famous than the *Camelion*, its admirable Properties have ever been the Subject as well of Natural as Moral Philoſophy. The changing of its Colour, and the particular manner of feeding which is attributed to it,have in all Ages given great Admiration and Exerciſe to thoſe that do apply themſelves to the Knowledg of Nature: And thoſe Wonders which Naturaliſts have related of this inconſiderable Animal, have made it to be the moſt Famous Symbole uſed in *Rhetorick* and *Ethicks*, to repreſent the baſe compliance of Courtiers and Flatterers, and the Vanity wherewith ſimple and light Minds do feed themſelves. Its very name in *Tertullian* is the Subject of a Serious Meditation upon Falſe-glory, and he propoſes it as the Example of the Impudence of Cheats and Boaſters.

It is not known truly why the *Greeks* have beſtowed ſo fine a Name, upon ſo vile and ugly a *Beaſt*, by calling it the *Little-Lyon*, or *Dwarf-Lyon* according to *Iſidore's* Etymology. *Geſner* ſays, that it ſomewhat reſembles the *Lyon*, without mentioning wherein. *Panarolus* would have it the Tail which is crooked at the end, as he ſays, like the *Lyons*: But the Truth is, that neither the *Camelion* nor the *Lyon* have a crooked Tail. It would be more probable to place the Reſemblance on the *Creſt*, which they both have on the Top of the Head, which makes a kind of Caſque: But it appears on the *Lyons* Head only, when the Fleſh of the *Muſculi Crotophitæ* is cutt off, *Licetus* thinks that this Name was given it, becauſe as the *Lyon* Hunts and Devours other Animals, ſo the *Camelion* catches Flies; by the ſame reaſon that a little *Worm* which Hunts and takes *Ants*, as *Albertus* hath deſcribed, is called *Formicaleon*; and that a little *Lobſter*, as *Pliny* and *Athenæus* report, is named *Lyon*, becauſe it is of the ſame Colour.

The *Camelion* is of the kinde of four-footed Beaſts, which do lay Eggs, as the *Crocodile*, and *Lizard*, which it ſufficiently reſembles, ſave that its Head and Back is not flat like the *Lizards*, who has likewiſe much ſhorter leggs, with which it crawls very faſt along the ground: whereas the *Camelion* has longer leggs, and goes eaſily only upon Trees, where it delights it ſelf much more than on the ground; becauſe, that as it is ſayd, it fears the *Serpents*, from which it cannot ſecure it ſelfe by flight, and that from thence it ſpies them, watching the opportunity when they do paſs, or Sleep under him, to Kill them with his Foam which he lets fall upon them.

Belonius has obſerved two Species of *Camelions*, one whereof is found in *Arabia*, the other in *Ægypt*. *Faber Lynceus* adds a Third, which is in *Mexico*. That which we deſcribe is the *Ægyptian* one; which is the greateſt of all: For thoſe of *Arabia* and *Mexico*, are not ordinarily more then ſix inches long, and ours which was brought us alive was in all, comprehending the Tail, eleven Inches and a half in length; *Pliny* is greatly miſtaken, when he makes the *Camelion* as big as the *Crocodile*, which is the biggeſt of all Animals: or if he intends to compare it to the *Land Crocodile*, he deceives his Reader, for that is leſs known than the *Camelion*, and whereof no body has ſpoken but himſelf, or upon his Report. *Salmaſius* attributes this Fault to the ill Tranſlation which *Pliny* has made of the Book, which *Democritus* writ of the *Camelion*; in which, according to the *Jonick Dialect*, the *Crocodile* is called by the Name which commonly ſignifies the *Lizard*. The *Head* of ours was an Inch and ten Lines; from the Head to the beginning of the Tail, it was four Inches and a half; the tail was five; and the Feet were each two Inches and a half long. The Bulk of the Body was found different at ſeveral times: For ſometimes it was two Inches from the Back unto the under part of the Belly; at other times it was ſcarce above an Inch, according as it ſwelled or contracted it ſelf; this ſwelling and this contracting was not only in the *Thorax* and Belly, but it reached even to its fore and hind-legs, and its Tail. This particular Circumſtance, which *Ariſtotle* has obſerved, makes us to think upon what *Theophraſtes* ſays of the *Camelions* Lungs, *viz.* That they do extend thro' the whole Body.

Now theſe contrary Motions of ſwelling and contracting are not done as in other Creatures, when to breath they dilate their Breaſt, and preſently contract it ſucceſſively and orderly; for we have ſeen it puft up above two Hours, during which time it abated a little, but very impreceptibly, and ſwelled again a little, but with this difference, that the Dilatation was more ſuddain and viſible, and that by long and unequal intervals. We have likewiſe ſeen it continue unſwelled for a long ſpace, and much longer than ſwelled. In this Condition it appeared ſo lean, that the *Spine* was ſharp, as if by the extenuation of the *Muſcles* which are without along the *Vertebræ*, the Skin was faſtened upon the ſpinous and oblique *Apophyſes*; which diſcovered three Eminencies. The Ribbs might be counted, and the Tendons of the fore and hind-legs appeared very diſtinctly to the Eye; But neither the *Vertebræ*, like a Saw, which *Geſner* and *Landius*, do in *Scaliger* report were ſeen on the *Back*, nor the *Pricks* which *Panarolus* ſaith were placed there by Nature for its defence, appeared to us: how lean ſoever it grew, its back only remained ſharp and keen, without being jagged or having any Points; the *Apophyſes* of the *Spine* being ſquare at the end, as in the generality of Animals. This lankneſs was known likewiſe when it turned its Body; for it ſeemed like an empty Sack that is twiſted; which *Tertullian*, who was of the ſame Country with our *Camelion*, had very well obſerved, when he ſays, that this Animal was but a living *Skin*.

This *Skin* was very cold to the touch; and notwithſtanding the great lankneſs I have been deſcribing, it was impoſſible to feel the beating of the *Heart*, which was more ſecret and obſcure than the motion of its Breathing.

The *Superficies* of the Skin was uneven, and raiſed in little Eminencies like *Chagrine*, being neverthleſs very ſoft to the touch, becauſe that every Eminence was very ſmooth: Theſe Eminencies or Grains were of a different ſize; the greateſt part were like the head of a middle-ſized Pinn, *viz.* The Grains which covered the fore and hind-leggs, the Belly and Tail: There were others ſomewhat bigger, of an oval Shape, upon the Shoulders and Head; and ſome of theſe large Grains were higher and more pointed, to witt, under the Throat, where they made a Row like Beads, which reached from the lower lipp to the Breaſt: The Grains which were upon the Back and Head, were joyned and heaped together, ſometimes to the Number of Seven, ſometimes Six, Five, Four, Three and Two; leaving between theſe different heaps, ſome diſtances covered with other little Grains almoſt imperceptible, which were generally of a pale *Red*, and *Yellowiſh* like the bottom of the Skin which appeared between theſe parcels of Grains. This Ground changed not Colour till the Animal was dead, at which time the little Points grew whiteiſh, and the Ground whereon they were ſowed, changed its *Red* into a *Dark-Gray.*

It has been ſince found, that all theſe Grains, as well the great as the little ones, were made by the Skin which ſwelled outward, being hollow on the inſide in the place of every Grain, like plates of Metal which are chaced or ſtamped; in part alſo thro' ſeveral little Pellicles very ſlender, and lying one upon another, which increaſed the thickneſs of every Eminence; which were eaſily raiſed, when they were ſcraped with a Penn-knife. But all this would not make the Skin reſemble that of a *Crocodile*, as *Ariſtotle* with moſt Authors would have it. For the *Crocodile* has upon its Back, very large thick Scales, proportionable to thoſe under its Belly; and they are ranged one upon another; whereas the Eminencies of the *Camelion*'s Skin, are ſpread without Order, and little differing in ſize.

The Colour of all the Eminences of our *Camelion* when it was at reſt in the ſhade, and had continued a long time untoucht, was a *Blewiſh-Gray*, excepting under the Paws, which was a *White* inclining to *Yellow*, and the Interval of the Heap of Grains, which was of a *Pale* and *yellowiſh Red*, as aforeſaid: And it is probable, that the natural Colour of the *Camelion*'s Skin, which according to *Ariſtotle* is *Black*, was in ours that *Gray* which covered the Skin all over when in Repoſe, and which remained on the inſide of the Skin when excoriated: Though the out-ſide had ſometime after its Death preſerved, the Spots and different Colours which were there at the Minute it expired, but which were well near all obſcured when the Skin was dryed.

Now this *Gray* which coloured all the *Camelion* expoſed to the Light, changed when in the Sun; and all the places of its Body which were inlightened, inſtead of their *Blewiſh* Colour, took up a *Browniſh Gray*, inclining to a *Minime*. The reſt of the Skin which was not illuminated by the Sun, changed its *Gray* into ſeveral brisk ſhining Colours, which made Spots about half a Finger in bigneſs, which reached from the Creſt of the Spine to the middle of the Back; others appeared likewiſe upon the Ribbs, fore-leggs and Tail. All theſe Spots were of an *Iſabella* Colour, through the mixture of a pale *Yellow*, wherewith the Grains were coloured, and of a brisk *Red*, which is the Colour of the bottom of the Skin which appears amongſt the Grains.

The reſt of this Skin not enlightened by the Sun, and which was of a Paler *Gray* than ordinary, reſembleing Cloth made of *Mixt*-coloured Wooll: For ſome of the Grains were ſeen of a *Gray* ſomewhat *Greeniſh*, others of a *Minime Gray*, othrs of the common *Blewiſh Gray*, the ground remaining as before.

When the Sun did not ſhine, the firſt *Gray* came again by little and little, and ſpread it ſelf all over the Body, except under the Feet, which continued of the ſame Colour, but a little *Browner*. And when being in this ſtate, ſome of the Company handled it to obſerve ſomething, there immediately appeared on its Shoulders, and fore-leggs, ſeveral very *Blackiſh* ſpotts about the bigneſs of one's Nail; which happened not when it was handled by thoſe that lookt after it: Sometimes it was marked with *Brown* Spotts, which inclined to a *Green*. We afterwards wrapped it up in a Linnen Cloath, where having been two or three minutes, we took it out *Whiteiſh*; but not ſo *White* as that of which *Aldrovandus* ſpeaks, which was not to be ſeen, by becoming exactly like the Linnen on which it was layed. Ours, which had only changed its ordinary *Gray* into a very pale one, after having kept this Colour ſometime, loſt it inſenſibly.

This Experiment makes us queſtion if it be true, that the *Camelion* takes all Colours except *White*, as *Theophraſtus* and *Plutrach* report: For ours ſeemed to have ſuch a diſpoſition to receive this Colour, that it waxed pale every night; and when it was dead, it had more *White* than any other Colour. We did not find likewiſe that it changed Colour all over the Body, as *Ariſtotle* reports: For when it takes other Colours than its *Gray*, and diſguiſes it ſelf to go in Maſquerade, as *Ælian* ſay's pleaſantly, it covers only certain parts of its Body therewith.

Laſtly, to conclude the Experiment of the Colours which the *Camelion* can take, it was lay'd on things of various Colours, and wrapped up there in; but it took not them, as it had done the *White*; and it took that only the firſt time it was made, although it was ſeveral times repeated on different Dayes.

In makeing theſe Experiments, we obſerved that there were a great many places of its Skin which grew *Brown*, but very little at any time. To be more certain thereof, we marked with little points of Ink thoſe Graines which to us appeared moſt *White* when it waxed *Pale*; and we always found that when it grew *Browneſt*, and its Skin ſpotted, thoſe Grains which we had marked were alwayes leſs *Brown* than the reſt.

Its Head reſembled that of a *Fiſh*, being very cloſely joyned to the Breaſt, and by a very ſhort Neck, which was covered on the ſides, with two *Cartilagineous* riſings, which reſembled the Gills of *Fiſh*. There was a Creſt erected juſt upon the Crown of the Head, and two other Creſts over the Eyes, turned like an S longways. Between theſe three Creſts there were two *Cavitys* along the upper part of the Head.

Its Noſe made an obtuſe Point; and there were two Edges which reached from the Eye-brows to the end of the Noſe, and which made it to reſemble that of a *Frogg*. *Ariſtotle* ſays *that it is like to the* Chœropithecus, which is an unknown Animal, the Name whereof ſhews its derivation to be from an *Ape* and *Hog*: But the Noſe of our *Camelion* reſembled neither that of the

Ape, nor of the *Hog:* for the lower Jaw ſtands out farther than the upper, which is quite different from the ſnout of a *Hog*.

At the end of the Noſe there was a hole on each ſide like a Noſtril. *Belonius* ſeems to be of opinion that theſe holes do likewiſe ſerve for the Hearing; and that ſo rationally, that *Alcmæon* ſayd, by the report of *Ariſtotle*, *that* Goats *do breath through the Ears*, which is a thing *Ælian* ſays, *ought to be beleived only by the* Goat-heards, altho' *Tulpius* in his Obſervations aſſures us, *that in Man himſelf there is found a paſſage which conveys the Air into the Mouth thro' the Ears.* The truth is, that our *Camelion* had no other holes in the Head but theſe two Noſtrils, through which it is probable it breaths, becauſe that its Mouth is commonly ſo cloſely ſhut, that it ſeems to have none, its two Jaws being joyned by an almoſt unperceivable Line, altho' *Solinus* Writes *that its Mouth is always open:* Which may make us to think that *Solinus*, and the genrality of thoſe which have deſcribed the *Camelion*, never ſaw one alive; for they do make the Mouth open, which is not uſual but when it is dead.

Theſe Jaws are furniſhed with Teeth, or rather with a dentillated or indented Bone, which to us appeared not at all ſerviceable to it in eating; becauſe that it ſwallowed the *Flyes*, and other Inſects which it catched, without chewing them. *Ælian* ſays *that it defends it ſelf againſt the* Serpent, *by the help of a great Stick which it takes in its Mouth*; and its probable that its Teeth may ſerve to hold it faſt; but it is to be underſtood that it holds it croſs-wiſe, to hinder the *Serpent* from ſwallowing him up, as it uſually do's *Frogs* and *Lizards*, whole: For there is no poſſibility of explaining this place of *Ælian* as *Geſner* and *Aldrovandus* do, who think that the *Camelion makes uſe of this Stick as of a Buckler or Sword wherewith it defends it ſelf againſt the* Serpent, as a Fencer would do; for it is not nimble enough for that.

The *Mouth* was ſlit after a peculiar manner: For whereas other Animals have generally the opening of the Lips, much leſs than that of the Jaws; the Lips of our *Camelion* were ſlit beyond the Jaw the length of two lines, and this continuation of the ſlit deſcended obliquely downwards.

The Form, Structure, and Motion of its Eyes had ſomething very peculiar. They were very large, containing above five lines in Diameter. They appeared *Sphærical*, jutting out full half of their Ball, which was covered with one ſingle Eye-lid made like a Cap pierced with a hole through the middle, this hole not exceeding one line in breadth. Through this little hole the *Pupilla* which was brisk and clear, and ſurrounded as it were with a little golden Circle, was eaſily enough perceived, although *Ariſtotle* ſay's that this Circle cannot be diſcerned till after that the Eye-lid be taken away by Diſſection. This Eye-lid was rough like the reſt of the Skin; and when the body variegated it ſelf into ſeveral Colours, making ſpots which were at different times of different Figures, thoſe of the Eye always remained of the ſame ſort; for the barrs or ſtreaks tinged with that Colour which came over the reſt of the Body, parted from the hole of the Eye-lidd as from a Center, and were extended towards the Circumference like rays.

The forepart of the Eye was faſtened to the Lid, which neither raiſed nor ſhut down it ſelf as in other Creatures, who can give their Eye-lid a different motion from that of the Eye, for that of our *Camelion* could not remove it ſelf, but the Eye-lidd followed its Motion. Which *Pliny* ſeems to expreſs, but very improperly, when he ſays *that the ſight or* Pupilla *of the* Camelio *ſtirs not, but that it is the whole Eye which moves* ; for there is no Creature that ſtirrs the *Prunella* when all the reſt of the Eye ſtands ſtill. But what is more extraordinary in this motion, is to ſee one of the Eyes move whilſt the other remains immoveable, and the one to turn forward, at the ſame time that the other looks behind; the one to look up to the Skie, when the other is fixed on the Ground: And all theſe motions to be ſo extream, that they do carry the *Pupilla* under the Creſt which makes the Eye-brow, and ſo far into the *Canthi* or Corners of the Eye, that the Sight can diſcern whatever is done juſtly behind and directly before, without turning the Head which is faſtened to the Shoulders. *Ariſtotle*, who has deſcribed the *Camelion* more exactly than any other Animal, has omitted this particular circumſtance of this extraordinary motion of the Eyes, which in truth is not found in the *Mexican Camelion*: But it is probable that is not that which *Ariſtotle* has deſcribed. He has not alſo obſerved that this little hole of the Eye-lidd cloſes by enlarging it ſelf croſs-wiſe, even to the making one ſingle ſlitt, which very exactly unites the upper part with the lower; for he ſays *that the ſides of that hole do never joyn together to cloſe the Eye. Pliny* and *Solinus* do likewiſe averr the ſame thing, and almoſt all Naturaliſts, who have only ſeen *Camelions* in the Books of theſe Authors.

That part of the Body which is called the Trunck, and which comprehends the *Thorax* and Belly, was in our *Camelion* a *Thorax* alone, with ſcarce any Belly; which *Ariſtotle* hath better obſerved than *Pliny*, who ſay's *that the* Camelion's *Breaſt is joyned to its Belly*; for that is not peculiar to it, being ſo in all Animals, which have nothing between the Breaſt and Belly. But when *Ariſtotle* ſay's, *that the* Camelion's *Breaſt as in* Fiſh, *is joyned to the* Hypogaſtrium, which is the lower Belly, he clearly ſhews that the Ribbs do deſcend as low as the *Ilia*, whereas other Animals have only the tranſverſe *Apophyſes* of the Loyns, the reſt being Bone-leſs, and therefore by *Hippocrates* called *Void*.

Its four Feet were alike. They differed only in this that the foremoſt were bent backwards, and the hindmoſt forwards, and it may be ſaid that theſe are four Arms which have their four Elbows bending inwards, every one conſiſting as it were of a *Humerus*, articulated with two Bones like to a *Radius* and *Cubitus*. *Solinus* is miſtaken, when he ſays that the *Camelion's* Feet are Joyned to the Belly; for in ours thoſe behind were articulated with the *Os Iſchium*, and thoſe before were faſtened to the *Omoplata*.

The four Paws were every one compoſed of five Claws, and better reſembled Hands than Feet. They, as well thoſe before as behind, were divided in two; which made as it were two Hands to each Arm, and two Feet to each Leg: For though one of theſe parts had but two Claws, and the other three, yet they were as large as one another, the Claws, which were two and two being larger than thoſe which were three and three. Theſe Claws were cloſed together under one skin as in a *Mittin*, and were divided only in the laſt Joynt, to which the Nails are faſtened. The diſpoſition of theſe Paws was different, in that thoſe that were before had two Claws outwards and three inwards, contrary to thoſe behind, which had three outwards and two inwards.

With theſe Paws it caught hold on the little branches of *Trees* like a *Parrot*,

rot, which to pearch it ſelf, divides its Claws different from other *Birds*, who do always put three before and one behind, whereas the *Parrot* puts two behind as well as before.

The Claws which were a little crooked, and very ſharp, and of a pale *Yellow*, proceeded but half way out of the Skin; the other half was covered and hidden underneath: They were in all two Lines and a half long.

Its Tail well enough reſembled that of a *Viper*, as *Pliny* obſerves, or that of a great *Rat*; which *Marmol*, who has Writ the Hiſtory of *Africa* in *Spaniſh*, ſeems to intimate; when he compares this Tail with that of a *Mole*, becauſe that the ſmall reſemblance that there is between the Tail of a *Camelion*, and that of a *Mole*, muſt make us to think that *Marmol*, according to the Cuſtome of the generality, of thoſe who publiſh the Relations of what they have ſeen in Forreign Countries, has without diſtinction intermixt what he hath Read, with what he hath Seen; and that he has taken what he ſpeaks of the *Camelion*'s Tail, out of ſome *Italian* Author, becauſe that *Topo* which in *Spaniſh* ſignifies a *Mole*, does in the *Italian* ſignify a *Rat*.

But the Tail of our *Camelion* was neither like to a *Vipers* or *Rats*, ſave when its ſwelling made it round; for otherwiſe it had all along the three Eminencies which are ſeen upon the Back, as aforeſaid, which are the rows of the *Spinous*, and *oblique Apophyſes* of the *Vertebræ*: Beſides theſe it had likewiſe two other rows made by the *Tranſverſe Apophyſes*. It always wound this Tail about the Branches, and it ſerved him inſtead of a fifth Hand. When it walked it very rarely ſuffered it to trail on the ground, but kept it parallel to the places where it went.

Its Pace was ſlower than that of a *Tortoiſe*, and ſeemed very Ridiculous, in that its Leggs being not ſhort, and incumbred like thoſe of the *Tortoiſe*, but very looſs and free, it carryed them with a kind of Gravity which ſeemed affected, becauſe needleſs. Wherefore *Tertullian* ſaith, *that one would think that the* Camelion *rather made as if it would walk than that it really did.*

Some do think that this Gate is a Mark of the Timerouſneſs, which is ſaid to be very extream in this Animal. But becauſe it is certain that Fear, when it is not great enough wholly to take away Motion, adds great Strength to that of the Leggs; into which it is beleived that it makes all the Heat and Vigour, which has left the Heart to deſcend. It is much more probable that this ſlowneſs is the effect of a great Præcaution, which makes it to Act circumſpectly. For it ſeems that the *Camelion* chuſes out places where it can beſt ſett its feet; and when it climbs up Trees it truſts not to its Claws, tho' they are much ſharper than thoſe of *Squirrels* which do every where climb up ſo lightly: But if it cannot graſp the Branches by reaſon of their bigneſs, it ſeeks out the clefts or cracks which are in the Bark, to faſten its Claws therein.

HAving opened our *Camelion* after it was dead, we found, when the Skin which covered the *Thorax* and Belly, was pulled off, that there was nothing underneath but Membranes which joyned the Ribbs together, and which were in the place of the *Muſculi Intercoſtales*. Theſe Membranes which were ſo tranſparent, that the Intrails might be ſeen through, were died green on the *Liver*.

The Belly being cut through the Middle up to the *Cartilago Xiphoides*, the Liver offered it ſelfe, out of which the Gall Bladder proceeded ſo as to touch the ſhort Ribs ; ſo we do call the Ribs which are not joyned to the *Sternum*, and which are after a particular manner in the *Camelion*, as hereafter ſhall be explained. We found the Veſicle between the Lobes; though *Belonius* placeth it in the left Lobe:It was a bout the bigneſs of a *Pea*, almoſt round, of a *Dark Green.* Its Neck produced the *Ductus Cholidocus*, which was inſerted underneath the *Pylorus.*

The Liver which was of a dark *Red*, and of a pretty firm *Parenchyma*, in which ſeveral Cavities or Paſſages might eaſily be diſcerned, was divided into two Lobes, whereof the Right appeared ſomewhat Larger than the Left.

The *Ventricle* lay under the Liver, and ſeemed to be only the continuation of the *Oeſophagus*, which enlarged it ſelfe a little in the Belly, along which it deſcended ſtrait enough, and was only a little bended towards the *Pylorus*, where it was contracted ; and there its Membranes were very hard. We wondered how ſo ſtrait a paſſage made by ſo hard a Membrane, could give way to the flyes, which were whole in the *Inteſtines*, and our Opinion was, that it muſt be that the *Pylorus* was capable of a diſtention like to that of the internal Orifice of the *Uterus*. This *Ventricle* was of the ſame Subſtance and Colour as the *Oeſophagus*, both being compoſed of *White*, and not Tranſparent Membranes, as were all the reſt that were found in the Belly. The *Oeſophagus* and *Ventricle* were together three inches and a half long. At the paſſage out of the *Pylorus* the *Inteſtine* was enlarged, and grew bigger than the *Ventricle*, making three turnings one on the right ſide of the *Pylorus*, the ſecond at the bottom of the Belly, where being deſcended, it roſe again towards the *Ventricle*, where it made the third winding. to re-deſcend towards the *Anus*. The length of this whole *Inteſtine* was ſeven Inches, and it kept the ſame bigneſs to the end. It was very *Black* all over, and one might ſee certain Membranes where with it was faſtened, which were the *Meſentery*, in which were likewiſe obſerved Veſſels full of Blood. There were alſo *White Fibres* like the *Venæ Lacteæ* ; and this Membrane of the *Meſentery* which was very tranſparent, had in its middle a piece which grew thick and opake,as it were to make the *Pancreas Aſellianum*, or *Receptaculum Pecquetianum*. Though it was impoſſible to get together the Branches of the Blood-Veſſels ſpread in this *Meſentery*, and to trace them to their Trunk, yet there was ſeen one which was judged to be that of the *Vena Porta*. The *Vena Cava* was likewiſe found under the Liver, lying upon the *Vertebræ*, and full of very *Black* Blood.

There was no appearance of the Spleen : Which agrees with what Authors averr of the *Camelion*. They do ſay likewiſe that it hath no Kidneys : However we found, that our's had two Fleſhy parts lying all along the two ſides of the Spine, in the region of the Loyns and the *Os Sacrum*, which we took for the Kidnyes: Theſe fleſhy parts were eaſily ſeperated from that place on which they were faſtened, that they could not be taken for the *Muſculi Pſoæ* ; and they were firmly fixed only at the place, where the end of the Inteſtine joyned it ſelf to the beginning of the *Uterus*. This particular circumſtance made *Gaſſendus* to beleive that theſe fleſhy parts, whereof he ſpeaks in the life of Mr. *Pieresk*, who had the curioſity to keep *Camelions*, might be the *Teſticles*. They were about an Inch long, near two Lines broad about the middle ; and they went ſloping to the end, making the figure of a Lancet. They were about the thickneſs of two thirds of a Line. Their

Parenchyma was of a pale *Red* very Solid, and watered within with ſtore of Seroſitie; which made us to take them rather for the Kidneys than *Teſticles:* And that which ſtrengthened and confirmed this Opinion, was a Cavity each of them had in its middle, according to their length, formed of a very hard Membrane, which might paſs for the *Pelvis* of the Kidney. *Malpighius* has obſerved the like paſſages in the Kidney's of *Birds*, which yet *Harvey* ſaith *are Solid, and without any Cavity.*

The *Uterus* had a paſſage which came out at the *Anus*. This Paſſage or Neck of the *Uterus* was placed on theſe Fleſhy Parts, which we thought to be the Kidneys, and under the extremity of the Inteſtine as in *Birds*, and wholly contrary to what is uſual in other Animals, where the *Inteſtine* is upon the *Os Sacrum*, and the Bladder above the Neck of the *Uterus*. This *Uterus* was as in Beaſts compoſed of two Horns, which came out of its Neck, and extended three Inches and a half in length, and returned to the ſame place, making as it were two *Anſes* or Handles when they were drawn from within the region of the *Ilia*, where they were folded up. They were not above a Line broad, and in ſeveral places leſs, where they contracted themſelves, making as it were knots: But we found no *Eggs* neither in their Cavity, nor in the annexed Membranes, called the *Ovarium*.

The generality of all theſe Parts, *viz.* the Liver, Ventricle, and Inteſtines, were upheld and ſuſpended by a ſtrong Membrane or *Ligament*, which like the *Mediaſtinum*, deſcended from the Region of the *Cartilago Xiphoides* to the lower part of the Belly. There were alſo ſuch like *Membranes*, which from the ſame *Cartilage* were extended on the right and left ſide, which were that which *Harvey* takes for the *Diaphragme* in Birds, and which *Fabricius* denys to be a *Diaphragme*, becauſe that they are not Muſculous. And indeed theſe Membranes were tranſparent, having no fleſhy ſubſtance, they were only double, and joyned to ſeveral others differently figured, as it appeared when having blowed into the *Aſpera Arteria*, both the great Vacuities on the right and left ſide of the Bowels, which hung in the middle, were ſuddainly filled by the ſwelling of thoſe Membranes, which were not diſcerned before it was blown; and this ſwelling did not only fill theſe Cavities, but it did thruſt out on both ſides ſome productions reſembling the Bladder of a *Carp*; ſome about the length and bigneſs of ones Finger, others much leſs, and from the great ones proceeded other leſſer Productions. In the middle of theſe two great heaps of different productions of Bladders, which repreſented the right and left Lungs, there likewiſe aroſe one ſingle Bladder, which ſeemed to ſupply the place of the little Lobe, which in a great many Animals is found in the middle of the Breaſt, in the Cavity of the *Mediaſtinum*. Theſe Membranes thus extended by Air were *White*, and ſomewhat tranſparent, and appeared very curious; but they were ſtrengthened by Fibres, inter-woven like Nets.

When we ceaſed to blow, all theſe Membranes falling down and lying upon one another, cauſed all theſe Bladders to diſappear, which indeed are nothing elſe but the *Proceſſus* of the Lungs.

Geſner ſaith, *that of the Intrails of a* Camelion, *the* Lungs *only are viſible.* But *Ariſtotle* has more truly obſerved, *that* Quadrupeds *which lay* Eggs, *have* Lungs *almoſt inviſible*; if they are not blown into to ſwell them. Indeed, whatever appeared in the place where the *Lungs* ought to be was, before it was extended by blowing, but like two little pieces of *Roſe-coloured* Fleſh, about the bigneſs of a *Bean*, ſituated on each ſide the Heart; which made *Panarolus* to ſay, *that the* Camelion *has little* Lungs. But theſe little pieces of Fleſh were not all the *Lungs*; they could be taken only for the Membranes of the upper part of the *Lungs* plaited and heaped together; which in this place were interſperſed with ſmall *Red* Eminences, which when the Wind dilated theſe Membarnes, appeared all over the extent of their Superficies; and when the Membranes ſubſided theſe little *Red* Eeminences approaching one another, cauſed again this appearance of Fleſh, which was no ſpongious Subſtance, as *Panarolus* would have it, but only a heap of contiguous Membranes.

The *Aſpera Arteria* was very ſhort, compoſed, as is uſually, of *Annulary Cartilages*. It had a *Larynx* at its beginning, made up as it were of two *Epiglottides*, which ſhut the opening or Chink, making a kind of *Glottis*, which was a tranſverſe ſlit, and not upright as it is in Animals that have ſome kind of Voice, of which our *Camelion* was wholly deſtitute.

The *Heart* was very little, not exceeding three Lines in length. Its Point appeared as if it were cut off. The *Auricles* of the Heart were very large, eſpecially the left, and ſomewhat *Redder* than the Heart, which was very pale. The *Veſſels* about the Heart were very full of Blood.

The *Brain* was found ſo little, that it was hardly above a Line Diameter, and was not twice as large as the *Spinal Marrow*, which was very *White*, the Brain being of a *Reddiſh-Gray*.

The *Optick Nerves* were not ſo ſhort, that the Brain ſhould be continued and faſtened to the Eyes, as *Ariſtotle* deſcribes them. They were not likewiſe as *Panarolus* repreſents them, who ſayth, *that they do proceed ſeparately from the* Brain, *but do not joyn again*; for there were two Eminences in the Brain, which were the *Origine* and firſt part of the *Optick Nerves*; and theſe Eminencies after joyning, ſeparated into two Strings eight Lines long a piece, and inſerted into the Ball of the Eye out of its *Axis*, as is uſual. This Globe was covered with a *Tunica Conjunctiva*; underneath which was the Inſertion of the Muſcles of the Eye, which were not fibrous *as* Panarolus *ſaith*, nor of little pullies, *as* Johnſon *would have it*; but a true Muſculous Fleſh.

Over the whole *Tunica Conjunctiva*, was an Orbicular Muſcle which faſtened the Lidd to the Eye, to which it was ſo adherent, that it ſerved to give the ſame Motion to the Lidd as to the Eye. Its particular Action was to cloſe the little round hole of the Lidd: this Muſcle being raiſed, the *Iris* was ſeen intire, which *Johnſton* ſaith the *Camelion* wants. It was of an *Iſabella* Colour, incompaſſed at its interior Edge with a little golden Circle, which has already been mentioned. The *Cornea* was very ſmall, the fore-part of the *Sclerotica* very thick and hard, and the hinder part very thin. The *Choroides Black* under the *Iris*, and *Blewiſh* in the bottom; the *Retina* very thick and ſomewhat *Reddiſh*; the *Humours* all *Aqueous*, ſo that it was impoſſible to didiſtinguiſh them; the *Cryſtallinus* it ſelf ſeem'd to be confounded with the other *Humours*.

Near the place through which the *Optick Nerves* do enter into the *Orbitæ* or Eye-holes, ſeveral very fine fibres of Nerves did likewiſe enter, and paſſing into the Vacuity which is in the middle of the *Orbitæ*, did penitrate into a great *Sinus* which was in the upper *Jaw-Bone* where are the holes of the Noſtrils. This *Sinus* was full of hard, fibrous, and very *Red* Fleſh, through which the paſſages of the Noſtrils did go; theſe paſſages being made thro' a very hard *Yellow* Membrane; they were oblique, aſcending all the way from the hole of the Noſtril into the *Sinus*, and afterwards they deſcended into the Palate, which by a very hard membranous production, covered the Extremity of each paſſage, in which we found nothing that could carry the Air towards any Organ for the Senſe of Hearing.

Ariſtotle has obſerved, that the generality of Fiſh do hear, though they have no conveyance for the hearing; but we have found neither any paſſages for ſound, nor any Sign in the carriage of our *Camelion*, which could make us to think that it had the Senſe of Hearing: So that it is a true Saying, that it is an Animal, that neither receives nor makes any Noiſe.

The Nerves which proceed from the *Spinal Marrow* were eaſily ſeen when the Intrails were taken away. They proceeded after the uſual manner, from the *Vertebræ*, and ſome of thoſe which were deſtributed into the fore-leggs came out from the ſuperiour *Vertebræ* of the *Thorax*, becauſe that the *Vertebræ* of the Neck which is very ſhort, could not ſufficiently afford them. They entered into the Capacity of the *Thorax* three on each ſide, which firſt united, and being afterwards divided, returned towards the *Omoplatæ*. Thoſe deſigned for the moving of the hind-legs, did after the ſame manner enter in at the ſides of the *Os ſacrum*, were united, and afterwards divided to diſtribute themſelves into the Leggs. Between every Rib there was one, which proceeding from the lower part of theſe *Vertebræ*, at the top whereof the Rib is articulated, went croſs-wiſe obliquely aſcending towards the Ribs, and accompanyed them to the end.

Ariſtotle ſays that the *Camelion* hath no Fleſh but on the Jaws, and at the beginning of the Tail: Ours had all over the Body, except underneath the *Thorax* and Belly, where inſtead of the *Muſculi intercoſtales*, and thoſe of the *Abdomen*, there was only tranſparent Membranes, but double and fibrous, which were thought capable of aſſiſting the Motion which the Ribs ought to have for the Reſpiration of the *Camelion*, which is very ſlow; the principal Organ of this Motion of the Ribs, being a fleſhy part which deſcended on both ſides of the Back-bone, near their Articulation, which might be the *Muſculus Sacrolumbus*. All the Back-bone, Tail, upper part of the *Thorax*, the fore and hind-legs were furniſhed with Muſculous, *Red*, fibrous Fleſh, whoſe *White* and *Silver-colour'd* Tendons were ſo viſible, that it would have been very eaſy to have made a Muſcular Diſſection thereof; all theſe Muſcles being without Fatt, of which we found no appearance in all the Animal, unleſs one might take for Fatt, four or five little Grains like to Millet, which were faſtened to the Membranes, and filled the Intervals of the Ribs: But the ſmallneſs of this Subject, which made it to dry ſpeedily, hindred us from making our Obſervations ſo particularly as it deſerves.

The laſt Obſervation which we made, but which is not the leaſt conſiderable, was upon its *Tongue*, the make and uſe of which is very extraordinary. We found that it was compoſed of a *White* Fleſh very ſolid, ten Lines long, three broad, round, and a little flattiſh towards the end. It was hollow and open at the end like a Sack, ſomewhat like the end of an *Elephants Proboſcis*. This Tongue was faſtened to the *Os Hyoides*, by the means of a ſort of Trunk like a Gut, ſix Inches long, and a Line broad, having a Membrane without and a Nervous Subſtance within. The Membrane was covered with Spots all along as if it had been imbued on the inſide with a *Blackiſh* extravaſſated Blood, unequally collected in ſeveral Places. The Nervous Subſtance in the middle was Solid and Compact, although very Soft, and was not eaſily divided into Strings like the Nerves which proceed from the *Spinal* Marrow. This Trunk ſerved to caſt out the Tongue which was faſtened to it, by extending it, and to draw it back by Contracting it ſelf; and it was our Opinion that when it ſhortened it ſelf, it muſt be, that the Membrane which covered it had a *Stylus* of a Cartilagineous Subſtance, very fine and ſmooth, inſerted into it, to the end of which the Trunck was faſtened, and on which its Membrane was plaited like a *Silk-Stocking* on the Leg: For we could not certainly underſtand how this Tongue could otherwiſe be retracted. This *Stylus*, which was an Inch long, took its Original from the middle of the baſis of *Os Hyoides*, as it is found in the Tongue of ſeveral *Birds*.

The Tongue was endowed with ſtore of apparent Veſſels, by reaſon of the Blood which was there in great abundance, as in all the reſt of the Body: Which made us wonder why *Ariſtotle* ſaid *that the* Camelion *has no Blood but about the Heart and Eyes*; and that the generality of the Moderns do place it among thoſe Animals that have little Blood.

It is probable that it was not the ſmall Eſteem which the Antients made of the particularities of this Tongue, which hindered them from ſpeaking thereof; and that if they had ſeen to what purpoſe the *Camelion* uſes it, they could not think that it liv'd by the Air alone: For this Tongue ſerves it for the catching of the Animals whereon it lives; and it is a very ſurpriſing thing to us to ſee the Swiftneſs wherewith it darts this Tongue at a *Fly*, and with which it draws it back again into its Mouth with the Prey, which it is ſaid that it never fayls to catch by the means of a Natural Glue which its Tongue inceſſantly Sweats forth, as we have obſerved, and which gathers together and thickens in its Cavitie, which penetrates not into the Trunk to which this Tongue is faſtened: So that to ſwallow what it has glued at the end of its Tongue, it is neceſſary that there be a kind of *Periſtaltick* Action performed by the Tongue, whoſe parts ſucceſſively joyned and preſſed againſt the Palate, do there cauſe to run into the Throat whatever it has to Swallow. The abundance of wrinkles which we ſaw run a croſs on the extremitie of this Tongue made us to be of Opinion that it muſt be ſo done.

Neverthelеſs *Marmol*, who ſay's *that he has ſeen a great many live* Camelions, with a deſign to explain himſelf upon this particular uſe of their Tongue, Aſſerts that it ſerves them not to catch Inſects, and that whatever he has obſerved of this Animal could not make him to alter his Opinion, that its only Nouriſhment is the Air and the Beams of the Sun.

Yet we have found its *Ventricle* and *Inteſtines* filled with *Flys* and *Wormes*, having ſeen it ſwallow them after the manner aforeſaid. We have likewiſe obſerved that the Excrements that it voided almoſt every day were mixed with ſtore of *Yellow* and *Greeniſh* Choler, and ſuch as they are in Animals which do live in ſomething elſe beſides Air: Which *Nidermayer*, Phyſitian to the *Landgrave* of *Heſſen*, who in the Year 1619. brought a live *Camelion* from *Malta* into *Germany*, hath already obſerved. Our's did many times void Stones about the bigneſs of a Pea; which it had not ſwallowed, but which were ingendred in its *Inteſtines*, as we diſcovered after a Curious Examination: For it was found that theſe Stones were ſo light, that being put into diſtilled Vinegar, they roſe from the bottom of the Veſſel when ſtirred; that they did there Diſſolve, and that one of them which cleft contained in its middle the head of a *Fly*, about which the Stony matter was amaſſed.

This made us to think that the *Lienteria* which *Panarclus* Reports, to be perpetual in the *Camelion*, was not the Diſtemper of our's, ſeeing that retaining the Uſeful things, it rejected thoſe only which were Superfluous, and not fit to be kept.

It is true indeed that it voided *Flyes*. which appeared almoſt as intire as it had taken them; but it is known that this happens to *Serpents*, which do *Evacuate* Animals whole as they have ſwallowed them: And every body know's that the manner of drawing the *Nutritive* Juice from the Food, is different in different Creatures; that ſome muſt Diſſolve what they Eat; and therefore they do firſt Chew it, and afterwards reduce it into Liquor in their Stomach; that others, who Swallow without Chewing, have a Heat and Spirits powerful enough to Extract the Juice they have need of, without breaking that which contains it, even as it is ſeen that the Juice of the *Grapes* is drawn as well from the *Rape*, where the Stones remaine whole, as from a *Vat* wherein they are bruiſed.

By theſe Obſervations we thought there was not leſs reaſon to doubt of the Truth of the Propoſition, which the Ancients had ſtarted touching the Aerial Nouriſhment of the *Camelion*, than we have had to reject that which they had eſtabliſh't touching the changeing of Colour which they have ſaid happens to it by the touching of the different things which it approaches, after having obſerved, that except the *White* which our *Camelion* took in a Linnen Cloath, all the other Colours, wherewith it was covered, proceeded not from the things which it touched. And it is rational to think, that the *White* which it received in a cold Linnen Cloath where it was kept ſome time as under a Cloak, was an effect of the Cold which generally made it grow *Pale*, becauſe that very day was the coldeſt of all thoſe whereon we obſerved it.

And to the end that *Naturaliſts* and thoſe which Study Morality may not be troubled for Curious Subjects to exerciſe their Philoſophy, which they thought to have found in the extraordinary particulars, which the Antients had left in Writing concerning the Wonders of the *Camelions* Nouriſhment and change of Colour, we do think that the new Obſervations of the Motion of its Eyes, and that of its Tongue, and the manner of changeing Colour according to its Paſſions, are altogether as capable of imploying their Witt.

For to demonſtrate that Flatterers want Sincerity, and that Vain and Ambitious Spirits feed on *Chimæra*'s; it is not neceſſary to be true that the *Camelion* takes all Colours but *White*, and that it lives only on Air: And one may find as much ground, but with more truth, to Moralize on this, that the *Camelion*, which is without Ears, and almoſt without Motion in moſt of its parts, hath Nimbleneſs only in the Tongue, which lets nothing eſcape it, and in the Eyes which can ſee all ways at once.

Naturaliſts will likewiſe have a great deal to do, before that they have clearly demonſtrated from whence proceeds the neceſſity which Nature has impoſed on all other Animals of Moveing both Eyes together after one manner. For the *Camelion* ſhews that it is not the joyning of the Optick Nerves, which cauſes this neceſſity, as many were of Opinion. They will alſo have trouble enough to tell what Power do's ſo far puſh out, and almoſt at the ſame inſtant draw back this Tongue, and even to produce inſtances like it. For the moveing of the Muſcles, which is attributed to the different poſition of their Fibres which makes them contract and extend, is nothing proportionable to the quickneſs of the Motion of this Tongne, nor to the greatneſs of the ſpace which it runs through. For when our hand is carryed ſwiftly for the ſpace of ſeven Inches, which is what we have obſerved the *Camelions* Tongue to move, the contracting of the Muſcles which gives this Motion to the hand, do's never exceed the length of two lines, that is to ſay the fortieth part of the contraction of this Tongue, And though, there be ſome colour to ſay that it is thruſt out, and if I may ſo ſay, Spitt out by the Effort of the Wind wherewith the Lungs are ſwelled, and that it is drawn back by the Nerve which is in the middle of the Trunck, which having been ſtretcht out by this Effort, makes it to return back to its firſt ſtate, and ſudainly draws in the Tongue. There is yet this difficulty, that this cannot be performed without a great deal of Noiſe and we have obſervthat this darting out of the Tongue cauſeth not the leaſt.

It is likewiſe a very difficult thing to imagine, what becomes of this Nervous Subſtance which fills the middle of the Trunck to which its Tongue is faſtened, and where it can diſpoſe it ſelfe when it is drawn into the Mouth. For when it is there, the Root of the Tongue do's almoſt touch the extremity of the Cartilaginous *Stylus*, on which ſuppoſing the Membrane of the Trunck to be folded and drawn on, as has been ſaid, that Nerve cannot be drawn on after the ſame manner, by reaſon that it is too Solid and compact; and this Solidity hinders us alſo from thinking that it ſhrinks, and as it were enters into it ſelf to retire from the ſix Inches in length, which it has when extended, to that of a Line, to which it is reduced being contracted.

It cannot be ſaid that it bends like the Neck of a *Tortoiſe*, when it draws its Head into its Shell, becauſe that this bending is performed by the aſſiſtance of Divers Muſcles, which do bend this Neck compoſed of ſeveral *Vertebræ*, and that ſuch Organs are not found in the *Camelion*'s Tongue. The Tongue which the *Wood-pecker* ſhoots out a great way beyond its Beak, has Organs alſo, whoſe Subſtance is much fitter for this Action, than that of the Trunk of the *Camelion*; for there are very long Muſcles, bending over the Head, which conſiſting of fleſhy Parts, have an aptitude to extend and contract themſelves, which in their great length may produce a conſiderable extenſion and contraction. So that we may ſay, that this ſo ſtrange a Motion of the *Camelions* Tongue, do's ſomewhat reſemble that of the Horns of a Snail, and that ſo great a length as this is reduced almoſt to nothing in this Trunck, by the increaſe of its thickneſs, and by a great dilatation, cauſed by the powerful and ſuddain rarefaction of the *Black* and thick Blood, which appears unequally diſperſed through the whole length of the Trunck. Yet that do's not ſufficiently explain the thing, becauſe that if the rarefaction cauſeth the dilatation which makes the contraction; it cannot afterwards produce the extenſion in the ſame Organe; and it is to be ſuppoſed that the extenſion proceeds from the rarefaction which is made in one of the two parts of which this Trunck is compoſed, *viz.* in the Nerve which is in the middle, and that the contraction happens when the Rarefaction is made in the other part *viz.* In the Membrane which is without it, by means of a different Situation of the *Fibres* in the one and other of theſe Parts: So as it is probable that the extending and contracting of the Tongue of other Animals is performed. But the bigneſs and Fleſhy Subſtance of other Tongues are Diſpoſitions to perform theſe Actions, which are wholly wanting in that of a *Camelion*, although this effects them with incomparably more Force; which makes that Motion Marvelous, and difficult to Comprehend.

But above all the change of Colour will a long time detain the Curious before they will Diſcover the Cauſe, and be able to Determine whether it is done by Reflexion, as *Solinus* thinks; or by Suffuſion, as *Seneca* is of Opinion; or by the change of the Diſpoſitions of the Particles which do compoſe its Skin, according to the Doctrine of the *Carteſians.* Yet it is True that the Suffuſion is moſt eaſie to comprehend, eſpecially to thoſe who ſhall have obſerved that the Skin of the *Camelion* has a Natural Colour, which is a *Blewiſh Gray*, which was ſeen on the inſide when it was flea'd; that there was eaſily taken away a great number of little Pellicles from above each of the Eminencies, which are the only Parts of the Skin which do change Colour; and that theſe thin Skins are ſeparated, or eaſily ſeparable one from another, whereas thoſe which do compoſe the reſt of the Skin, are exactly faſtened together. For theſe things having been obſerved, there will be found ſome probability to think that Choler wherewith this Animal abounds, being conveyed to the Skin by the Motion of the Paſſions, may creep between theſe Skins,and that according as the Choler enters under a Pellicle nearer, or more remote from the exteriour Superficies of the Eminencies, it Dy's them *Yellow* or *Green*: For it is ſeen by experience that *Yellow* mixt with a *Blewiſh Gray* makes a kind of *Green*; ſo that it is eaſie to Imagine that the ſame Choler ſpread under a very thin Pellicle may make it appear *Yellow*, and that being under a thicker Skin it mingles its *Yellow* with the *Blewiſh-gray* of this Skin, to produce a *Greeniſh-gray*, which with the *Yellow* are the two Colours that the *Camelion* takes when it is in the Sun, where it Delights its ſelf: For when it is moved by things which diſturb it, it is not ſtrange that the *Black*, and aduſt Humour which is in the Blood, being carryed to the Skin, ſhould there produce the *Brown* Spots which appear on it when is Angry; even as we do ſee that our Countenance becomes *Red*, *Yellow*, or *Livid*, according as the Humours, which are Naturally of thoſe different Colours, are carried thither. By the very ſame reaſon alſo, when by a contrary Motion the Humours, wherewith the Skin is Naturally imbued, do return into the Veſſels, or diſſipate themſelves, ſo that others do not ſucceed in their place, the Skin waxeth *White* by the ſeparation of the Pellicles, which do compoſe the little Eminencies; for this *Whiteneſs* happens to them as to our *Epidermis* or *Scarf-skin*, which being dryed, and ſeparated into little Flakes in the Diſeaſe called *Pityriaſis*, the Skin *Whitens* extraordinarily, and ſeems to be rub'd over with Meal. Abundance of ſuch probable reaſons may be found, before any one ſhall occurr, whereby the Truth may be demonſtrated.

But to conclude our Obſervations on the *Camelion* with ſomthing more Solid than is in this Philoſophy of Colours, we will relate the Remarks which we made on its Bones, whereof we do keep the *Skeleton*, and wherein we have obſerved a great many conſiderable particulars.

The Bones which compoſed the *Cranium* or Skull ſeem'd to be made only to ſuſtain the *Crotaphitæ* which filled all the Head, as well without as within with a Whiteiſh and Fibrous Fleſh. The three *Creſts* which were upon the Head mett together in one point towards the Back part. Two of theſe Creſts which covered the Eyes like Eye-brows left great vacuities, each making a kind of *Zygoma*. The prnicipal cavity of the Skull conſiſted in the *Orbitæ* or *Eyeholes*; for that wherein the Brain is contained was without compariſon the leaſt. Theſe two *Orbitæ* were open one into the other, ſo that the Eyes touched on the inſide, as is ſeen in ſeveral Birds: Which *Pliny* has excellently deſcribed, when he ſays that the *Camelions* Eyes are very large, and little diſtant one from the other. For this little ſeparation cannot be meant of that which is at the Face between each Eye, becauſe that is very broad in all *Camelions*; this little diſtance of the Eye one from the other in the Face being proper to Man only, as the greateſt is peculiar to Sheep, according to *Ariſtotles* opinion.

Each half of the lower Jaw was compoſed of two Bones articulated *per Diarthroſin*, the *Apophyſis* which goes from the corner of the Jaw to the *Condylus* which is articulated with the Bone of the Temples being a diſtinct Bone.

The Back-bone, comprehending the Tail, had ſeventy four *Vertebræ*, two in the Neck, eighteen in the Thorax, two in the Loynes, two at the *Os Sacrum*, and fifty in the Tail.

The firſt of the Neck was the only one which had its Spinous *Apophyſis* bent upwards, and which was differently from the reſt received on both ſides. All the other had in their Body a Cavity in their upper part which received, and in the lower a Head which was received by the Cavity of the next, which made a kind of *Ginglymos*. All in general had their ſeven *Apophyſes*, except the *Vertebræ* of the Tail, which have eight, *viz.* two Spinous, a large one, and another very ſmall one underneath. with the two tranſverſe and four Oblique ones, by the means of which all the *Vertebræ* were articulated, the oblique Superiour *Apophyſes* of one *Vertebra* paſſing over the lower of the *Vertebra* next above it.

The Ribbs which *Geſner* makes ſixteen were eighteen of each ſide, and of three ſorts. The two firſt above reacht not to the *Sternum*, no more than the three laſt below. The third, fourth, fifth, and ſixth, were joyned there by *Appendices*, which were not *Cartilaginous*, but of the ſame Subſtance with the Ribbs; and theſe two ſorts of Ribbs were joyned together by an Angle which they made, the one deſcending downwards, and the other aſcending towards the *Sternum*. The other nine Ribbs were not faſtened to the *Sternum*; but each was joyned to its oppoſite, by the means of a common Appendix, and which went from the right Ribb to the left, being bent in the middle of the Breaſt and Belly.

The *Sternum* was compoſed of four Bones, the firſt of which was very large, and made like a *Trefoyle.*

The *Ompolatæ* or Shoulder-blades were ſo long, that they reached from the Back-bone to the *Sternum,* to which they were joyned inſtead of *Claviculæ.* The *Oſſa innominata* were after the uſual manner joyned by the *Os Pubis*; but the *Iſchium* was not firmly articulated to the *Sacrum* by a *Cartilage*: For it was the *Os Ilium* which was there faſtened by a looſs Ligament: So that it appeared that theſe Bones, after the ſame manner as the *Omoplatæ,* have a Structure and connexion altogether different from what is found in all other Animals, where the *Omoplatæ* are faſtened to the Trunck of the Body, but by very looſs Ligaments, in compariſon of the *Oſſa Innominata*: And it has been obſerved that the *Omoplatæ* in the *Camelion* are very cloſely faſtened to the Trunk, as has been ſaid; and the *Oſſa innominata* on the contrary are very moveable, even as the *Omoplatæ* are in other Animals.

The *Oſſa Innominata* made a hole forewards on each ſide, but which was partly formed by the *Os Pubis,* and partly by the *Iſchium.*

The *Humerus* which was articulated with the *Omoplatæ per Ginglymon,* as the *Femur* is generally with the *Tibia*, had an *Apophyſis* near its Head like to a *Trochanter*; and the *Femur,* which was joyned with the *Iſchium per Enarthroſin* had no *Trochanter*'s.

The Leggs as well before as behind were alike, being every one compoſed of two Bones, which rather reſembled a *Radius* and *Cubitus,* than a *Perona* and *Tibia*, becauſe that they were both articulated to the *Femur* as well as the *Humerus,* and were both capable of bending upwards and downwards.

The Feet and Hands, or rather the four Hands, were alſo alike, and differed only in this, that the Fore-feet had as it were a *Carpus* compoſed of twelve little Bones, and thoſe behind had ſomething which rather reſembled a *Tarſus,* becauſe that the Bones were larger than thoſe which ſeemed to make the *Carpus,* Yet there was none which jetted out enough behind to make a *Talus*; which might be one of the Cauſes which makes the *Camelion*'s Pace ſo ſlow. Theſe Bones of the *Tarſus* were ſix in Number. There was neither *Metacarpus,* nor *Metatarſus*; unleſs you would ſo call the two firſt *Phalanges* of the Toes, becauſe that they were joyned together as the Bones of the *Metacarpus,* and *Metatarſus* commonly are, there being only the laſt *Phalanges* which were ſeparated, and appeared like Toes. There was likewiſe this difference between the Feet and Hands; for in the Feet the Part which hath three Toes was articulated on the right ſide of the greateſt of the two Bones which do make the Leg; and on the contrary in the Hands, it was ſet againſt the leaſt of thoſe whereof the Arm is compoſed.

After having made theſe Remarks, we found that the *Skeleton* and *Skin,* which was layd up, retain'd for ſome time a ſtrong Scent, inclining much to that of *Fiſh* begining to ſtink; and that this ill Smell, as theſe parts grew dryer, was changed into a Sweet and agreable Smell, very like that of the Roots of the *Iris* and *Violett Flowers*; and that at laſt all the Odour Evaporated, when the reſt of the *Humiditie* was conſumed.

As for the knowledge of the incredible Virtues which the ſuperſtition of the ancients hath attributed to the *Camelion* and of which *Pliny* ſaith that *Democritus* hath writt a whole Book, they are ſo Extravagant in the Judgment even of *Pliny*, that we referr our ſelves to his opinion thereof: And without trying whether we could raise Tempeſts with its Head, or gain Law-ſuits with its Tongue, or ſtop Rivers with its Tail, and do the other Miracles which it is ſaid *Democritus* hath left in Writeing; we were contented to make thoſe Experiments which ſeemed to have ſome probabilitie, being founded on Sympathie and Antipathy, ſuch as is that which *Solinus* Reports to be ſo great between the *Crow* and the *Camelion*, that it dyes immediately after having Eaten of its Fleſh. The truth is that a *Crow* peckt ſeveral times with its Bill on our *Camelion*, when it was ſet to it Dead; and we gave it ſeveral Parts of it to Eat, and even the Heart it ſelf, which it ſwallowed without any harm.

The Explication of the Figure of the DROMEDARY.

IT is repreſented in the lower Figure, ſo that there may be ſeen the highth of the Bunch which it has upon the Back, and which is for the moſt part compoſed of long Hair, which ſtands upright. There is alſo ſeen the four Kinds of *Calloſities,* which are at the Parts on which it reſts it ſelf when it lyes down, *viz.* The two *Calloſities* of the Fore-leggs, that of the Thigh, and that of the Breaſt. Its Feet are likewiſe ſo raiſed that they do preſent a part of the Sole to the Eye.

In the Upper Figure.

A. *The firſt and greateſt of the four* Ventricles.
Γ. *The* Oeſophagus.
B. *The ſecond* Ventricle.
C. *The Third.*
D. *The Fourth.*
E. *The* Pylorus.
F F F. *The ſecond* Ventricle *cut in four.*
G. *The hole which is the paſſage of the firſt and great* Ventricle *into the ſecond.*
h h h h. *The holes of the Sacks, which are between the Coats of the ſecond* Ventricle.
I. *The* Glandula Pinealis.
K. *The Sole of the Foot, which is Solid, and covered with a very ſoft and delicate Skin.*
L. *The upper Part of the Foot, which is a little Cloven.*
M, *The* Penis.
N O. *The Tongue.*
O P. *The Part which is rough from the inſide to the end, by reaſon of an abundance of little pointed Eminencies.*
N q. *That which has the greateſt Eminencies turned after the ſame manner as the little ones.*
q p. *That which has likewiſe great Eminencies, but which are turned oppoſite to the little ones.*
q. *The Center of the great Eminencies.*

THE
ANATOMICAL DESCRIPTION
OF A
DROMEDARY.

THis Animal here deſcribed we call a *Dromedary*, altho' the common practiſe be to give the name of *Camel* ſimply to that which like it has but one Bunch on the Back, and of *Dromedary* to that which hath two according to *Solinus*, but contrary to what *Ariſtotle* and *Pliny*, and the generality of Authors have Writt thereof, who do make two ſorts of *Camels*: whereof one, which retains the Name of the *Genus*, has two Bunches, and is moſt commonly found in the Eaſtern parts of *Aſia*, and is therefore called *Bactrianus*; it is alſo bigger and more proper to carry heavy Burdens: The other, which is Leſſer, and fitter for the Courſe, and which for this reaſon is called *Dromedary*, has but one Bunch, and is moſt commonly ſeen in the Weſtern Parts of *Aſia*, viz. in *Syria* and *Arabia*. The *Sieur Dipi* an *Arabian*, who was preſent at our Diſſection, informed us that the *Camels* of his country are like to Ours.

It was ſeven Foot and a half high from the Crown of the Head to the Feet; five and a half from the higheſt bending of the Back-bone, which is the Bunch; Six Foot and a half from the Stomach to the Tail, of which all the Knots or *Vertebræ* were fourteen Inches together; and all the Tail comprehending the hair, two Foot and a half. The Head was One and Twenty Inches from the hinder-part to the Noſe.

The Hair was of a *Fawn-Colour* inclining a little to an *Aſh-Colour*. It was very ſoft to the touch, moderately Short, and ſomewhat ſhorter than an *Oxe's*, excepting ſome places, where it was longer, as on the Head, under the throat and on the fore-part of the Neck. But the longeſt was on the middle of the Back, where it was near a foot. In this place, although it was very ſoft and limber, it ſtood erect, ſo that it made the greateſt part of the Bunch of the Back, which when this hair was preſſed down with the hand, hardly appeared more Elevated than a *Doggs* or *Swines*, which are Animals that have not the Back Sunk, as *Horſes*, *Cows* and *Staggs* generaly have. And indeed there are ſome Authors which do ſay, that the *Dromedary* is engendred of the *Camel* and *Hogg*. This is very repugnant to *Ariſtotle*, who aſſerts, that there is no Animal which hath the Back bunched like the *Camel*. Some Authors do ſay, that this Bunch is a Fleſh peculiar to this Animal, which riſes upon the Back over the *Vertebræ*, and which waſts away, when after a long abſtinence from Food, it grows extraordinary lean. But we found not any appearance of this Fleſh in our Subject, although it was not lean; and without this Fleſh, the Bunch which was made only by the Hair, was much raiſed, as is ſeen in the Figure.

Beſides theſe two ſorts of Hair, *viz.* The long which was upon the Back, Head, and Neck, and the ſhort which covered the reſt of the Body; there was likewiſe a third ſort at the Tail, which differed from the others, as well in bigneſs as Colour, being Gray and very ſtrong, and altogether like the Hair of a *Horſe*'s Tail.

The Head was little in Proportion to the Body; the Noſe was cleft like a *Hare*'s, and the Teeth like to thoſe of other Animals which do chew the Cud, having no *Dentes Canini* nor *Inciſores* in the upper Jaw; although the Head wants the Horns which Nature has given, and beſtowed on the greateſt of thoſe which do chew the Cud. *Cardan* ſays that it has recompenſed this defect of the *Camel*; by arming its Feet, which have Hoofs like thoſe of *Oxen*, according to *Pliny*: But that is not found, for it has neither Horn nor Hoof on the Feet which can render them dangerous, each Foot being furniſht only with two little Nails at the end; and the Sole which is flat and broad, being very fleſhy, and covered only with a ſoft, thick, and ſomewhat callous Skin, but very fitt and proper to travel in ſandy Places, ſuch as are in *Aſia* and *Africa*. We thought that this Skin was like a living Sole, which wore not with the ſwiftneſs nor continuance of the March, for which this Animal is almoſt indefatigable: For when *Ariſtotle* ſays, that they are ſometimes forc't to defend, as it were, with Boots the Feet of thoſe which are in the Armies; it ſeems to be not ſo much to eaſe them from the inconveniencies which they do undergo in travelling, as to prevent and keep off the Wounds which they might receive in the Warr. And it may be ſaid that this ſoftneſs of Foot, which yeilds and fits it ſelf to the ruggedneſs and unevenneſs of the Roads, do's render the Feet leſs capable of being worne, than if they were more ſolid; although *Pliny* thinks that it is not poſſible, that *Camels* can make long Journies if they are not ſhod: Its callous Knees are much harder, and do nearer approach the Solidity of the horny Hoof of other Animals.

Ariſtotle hath remarkt other Particulars in the Foot of the *Camel*, which we have not found there. He ſays that it is cleft in two behind, and in four before, and that the interſtices are joyned by a Skin like the Feet of a *Gooſe*, which was not found in ours, whoſe Foot was only cleft at top, within four or five Fingers of the end; and this ſlitt was not joyned by a Skin, but underneath this ſlitt which is ſhallow and not very deep, the Foot was ſolid.

The *Calloſities* of the Knees were ſix in Number, *viz.* one at each of the Joynts of the fore-leggs, the firſt and higheſt being behind, at the Part which is properly the *Cubitus*; and the ſecond and lower of the two before, upon the Joynt of the Knee which repreſents the Wriſt: Each hind-legg had likewiſe one on the firſt and higheſt Joynt, which is that before, and which is the true Knee.

Ariſtotle, who has obſerved but four of theſe *Calloſities*, which he calls Knees, and who groundleſsly reproves an ancient Author, which is *Herodotus*, for having made ſix, adds alſo a thing more ſtrange, which is to ſay, that the *Camel* never bends its Leggs but in theſe four places: For the Truth is, that it bends them in Eight, like other Quadrupeds, and that there are only the two bendings which do ſupply the place of the Heel in the hind-leggs, which have no *Calloſities*.

Having opened theſe *Calloſities*, to obſerve their Subſtance (which is between Fleſh, Fat, and Ligament) we found that in ſome there was a heap of thick *Pus*; which made us to think as ſome Authors do report, that *Camels* are ſubject to the Gout; and we conceived that it might be, that our *Dromedary* had been tainted with this diſtemper, which was ended by a Suppuration.

Beſides theſe ſix *Calloſities*, there was a ſeventh much bigger than the reſt, at the bottom of the Breaſt, firmly joyned to the *Sternum*, which had an Eminence in this Place. It was eight Inches long, ſix broad, and two thick. It was likewiſe very much ſuppurated, and it was judged that this Part was as ſuſceptible of the Gout as the Articles or Joynts, becauſe that its uſe being to ſupport the whole Body alone whilſt it was loading, couched upon the Ground, that hardſhip might make this Part capable of the weakneſs and heat which do attract the humors on the Joynts, and which do hinder that they cannot digeſt and diſperſe them. The great Sobriety which is remarkable in the *Camel*, and the incredible Fatigue which it generally ſuffers, do demonſtrate that the greateſt hardſhips may produce the Gout, as well as Idleneſs and Debauchery.

Before we opened it to obſerve the inward Parts, we took notice that the ***Præputium***, which is very large and looſe, covered not only the end of the ***Penis***, but that it turned backwards; which may have given occaſion to the Opinion of thoſe, who have thought that the *Camel* piſſed backward, like the *Lyon*, *Caſtor*, *Hare*, *&c.* whoſe *Penis* bends not forward.

The internal Parts are very like to thoſe of the *Horſe*. The Liver had three Lobes, two very large ones, in the middle and underneath which there was one which was leſſer and pointed. The Ligament which held the Liver ſuſpended was not faſtened to the *Cartilago Xiphoides*, but to the center of the *Diaphragme* on which the Membrane of the *Peritonæum* which covered it, had a luſtre, which made it appear as it were all over gilded. The Gall was not contained in a *Cyſtis*, but ſpread over the Liver, in its *Ductus Cholidochus*.

The *Ventricle* which was very large, and divided in four, as in the other Animals which chew the Cud, had not that different Structure, which is obſerved within the four Ventricles called by *Ariſtotle*, Κολία, Ἐχῖνος, Κεκρύφαλος, Ἤνυστρον. They were only diſtinguiſhed by ſome ſtraitenings, which made that the firſt Ventricle, which is large and vaſt, produced another very ſmall one, which was followed with a third, ſomewhat leſs than the firſt, but much longer; and this was followed by a fourth like to the ſecond.

At the top of the ſecond Ventricle there were ſeveral ſquare holes, which were the Orifices of about twenty Cavities, made like Sacks placed between the two Membranes which do compoſe the Subſtance of this *Ventricle.* The vew of theſe Sacks made us to think that they might well be the Reſervatory's where *Pliny* ſays that *Camels* do a long time keep the Water, which they do drink in great Abundance when they do meet with it to ſupply the wants which they may have thereof in the dry Deſarts where they are uſed to travel, and where it is ſaid that thoſe which do guide them are ſometimes forc't by extremity of Thirſt, to open their Belly, in which they do find Water. There is likewiſe ſome reaſon to ſay, that the inſtinct which *Ariſtotle* and *Pliny* have obſerved to have been by Nature beſtowed on this Animal, of always troubling and muddying with its Feet the Water which it would drink, might rather be to render it heavy, and conſequently leſs fitt to paſs ſpeedily, and more capable of being a long time retained in its Stomach.

The Inteſtines were of four ſorts. The firſt at the enterance of the fourth Ventricle were of a middle-ſize; they were ſix Foot long. The ſecond were, as it were ruffled and contracted by ſeveral folds, as the *Colon* uſually is by means of a Ligament which tacks it together, and makes it as it were divide into ſeveral cells. Theſe were alſo of a middle-ſize, and were twenty Foot long: The laſt which were the ſmalleſt were Fifty ſix Foot long; the whole making eleven *Toiſes*; and there would have been found above thirteen, if thoſe had been unfolded which were ruffled and contracted.

The Spleen was layd upon the left Kidney. It was Nine Inches long, four broad, and half an Inch thick.

The *Penis*, of which it is ſaid, that Bow-ſtrings are made, was Nineteen Inches long. It was very pointed at the end, which was bent, and made as it were a Hook of a cartilaginous Subſtance, without any appearance of the *Balanus.* The Extremity of the *Vreter* was a very ſmall Membrane.

The Lungs had but one Lobe on each ſide. The Heat was of an extraordinary bigneſs, being Nine Inches in length, and ſeven in breadth: It was very pointed.

The Structure of the Tongue was remarkable, in that contrary to all Tongues which are all over aſperated inward, by the means of abundance of little Eminencies which do tend inwards; one part of this Tongue had them from the in-ſide to the out-ſide; for the half towards the end which was very ſmall, was rough as uſually from the in-ſide to the out-ſide; but the other half near the Root which was very thick, had towards the middle a little Circle, like a Center amongſt ſeveral Eminences, which covered all this ſecond half of the Tongue, and whoſe Points were all turned from this Center, making a roughneſs when we rubed them towards this Center. Amongſt theſe Eminencies there were others placed in two Rows, in a direct Line, five in each Row, which were Navils, formed by wrinkles folded round after a very delicate and curious Structure. The Figure explains this more clearly than the Diſcourſe.

The whole Brain comprehending the *Cerebellum*, was but ſix Inches and a half long, and four broad. The *Optick Nerve* was pierced, according to its length, with a number of holes full of Blood. The *Proceſſus Mamillares* were very large and hollow, having each two *Ductus's* or paſſages, the one of which appeared round, and the other like a Creſcent, by a tranſverſe Section. The *Glandula Pinealis* was about the bigneſs of a ſmall Filbert, and as it were compoſed of three other Glands, which left a dent in the middle.

The Explication of the Figure of the BEAR.

IN the lower Figure the *Bear* is repreſented two ways, *viz.* with its Skin on the one ſide and without it on the other ; the more plainly to diſcover the Forme and Shape of its body, which is principally remarkable in its Hind-leggs.

In the Upper Figure.

A B C. *The left fore-paw.*
B. *A little Toe which is in the place of the* Pollux.
A. *A Great Toe in the place of a little one.*
f. *A Calloſite on the* Carpus, *which as it were makes a Heel.*
D E G. *The left hind-paw.*
E. *A little Toe which is in the place of a bigger.*
D. *A great Toe in the place of a leſſer.*
G. *The Heel covered with Hair.*
H I. *The Two* Ventricles.
H. *The* Oeſophagus.
I. *The* Pylorus.
K L. *The left Kidney.*
M M. *The* Ureter.
N N. *The* Vena Emulgens.
O O. *The* Arteria Emulgens.
P Q. *The ſame Kidney inverted, and from which ſome of the little Kidneys are Taken away, to diſcover on the inſide the diſtribution of the* Emulgent *Veſſels and* Ureters.
R S T T. *One of the little Kidneys cut through the middle.*
R. *The* Emulgent Arterie *of one of the ſmall Kidneys.*
S. *The* Emulgent Vein.
T T. *The* Ureter *of one of the ſmall Kidneys cut in two length-wiſe.*
V V. *The* Papillæ.
Y Y Y Y. *The halves of the* Pelves.
X X. *The little* Sinues *which are between the* Pelves *and* Papillæ.

THE

THE ANATOMICAL DESCRIPTION OF A BEAR.

THe bigneſs and thickneſs of the Hair, in which the whole Body of the *Bear* is hid after ſuch a manner, that it ſeems to be but one lump, which hardly has any appearance of an Animal, has made it to be rightly called by *Virgil Informe*; but there is no one which do's not find it wholly *Difforme*, when the Skin being flead off, it's true ſhape and Figure may be ſeen, without any hindrance or obſtruction. This deformity, juſt as that of the *Ape*, which is accounted the uglieſt of all Creatures, is founded on the the ill reſemblance which they both have, with the handſomeſt of all Animals, by the general and ever true Rule, that the depravation of things the moſt perfect is the worſt.

That which makes the Body of Man admirable, according to *Galen*'s Opinion, is the ſtructure of the Hands and Feet, which diſtinguiſhes his Body from that of other Animals, even as Reaſon makes the differenee of Souls. This Structure is altogether extravagant in the *Bear*, in that having ſomething which in appearance, approaches that which makes the perfection of theſe Organs; it is found that in Truth, that which is moſt important in their conformation is depraved, or wholly defective in the *Bear*. *Galen* Remarks two things, which are principally neceſſary for the conveniency of the uſe of theſe Parts, *viz.* In the Hand, that its five Fingers be generally divided into two Parts, having four of them joyned together, which are as it were of one ſort, and a fifth Part which is ſo ſeparated, to ſerve the principal Action of the Hand which is to take hold; and in the Foot, that it is compoſed of the Heel of one ſide, and of the five Toes which oppoſe it on the other, as the four Fingers of the Hand are oppoſite to the Thumb; to make the Step more ſure and firm, by the different application of theſe two Parts, to the Figure of the things on which we tread.

Pliny, who has ſpoken of the reſemblance which the Paws and Feet of the *Bear* have with thoſe Parts of Man, has not well underſtood it, making it to conſiſt in the Poſition of the Elbows and Knees, which he Reports to be in the *Ape* and *Bear* as in Man, and contrary to other Animals, who have the Knees behind and Elbows before: For the Truth is, that all Animals have theſe Parts turned after the ſame manner, whatever *Ariſtotle* may report thereof; and that what is there found different, proceeds from hence, that the Heels in Brutes are taken for the Knees, the *Carpus* or the *Cubitus*: Becauſe that the Bone which makes the Heel of Man, is ſo lengthened in Brutes, that it is taken for the Legg, and that the Wriſt, which in Man is compoſed of a connexion of eight ſmall Bones, almoſt round, which is called *Carpus*, has in the generality of Brutes one of theſe Bones very long, and which is taken for the fore-legg, though it be properly one of the bones of the *Carpus*. So that the Leggs and Paws of the *Bear* are in this only as in Man, that they are fleſhy, although *Ariſtotle* ſays that there is none but Man which has them ſo: That the *Os calcis* or Heel-bone is ſhort, and makes a part of the Sole of the Foot: That there are five joyned together, and oppoſed to the Heel, and that its Paw has likewiſe the Bones of the *Carpus* almoſt even, and united like ours; but in its Paw it has no Thumb ſeperate from the four other Fingers, and the biggeſt of the five which do compoſe the Paw, and which has only that bigneſs which may make it to paſs for a Thumb, is placed quite contrary to Mans, being on the outſide, and in the place of the little Finger, even as on the Foot where the greateſt Toe is alſo on the outſide. As to the Foot it is not uſually reſted on the Heel, which by reaſon hereof is covered with Hair like the Legg, and has no *Calloſities*, nor that kind of particular Skin which defends the Sole of the Foot, and which leaves its Print on the places where it has gone. On the contrary, its Paw has as it were a Heel, that *Calloſity* which is in the palm of the Paw, being interrupted by the hairy Skin, to begin another *Calloſity* a little higher. In a word, the Fingers of the Paw are likewiſe very ill ſhapen, and unfit for their uſes, being great, ſhort, and faſtened to each other as in the Feet.

The Subſtance of theſe Parts is not leſs particular, nor leſs remarkable than their Structure. *Pliny* and *Plutarch* do report that it is an excellent Food; and *Michael Herus* ſays that in *Germany* they are even at preſent reſerved for Princes Tables, at which the Paws of the *Bear* are ſerved up ſalted and ſmoaked. We obſerved that this Subſtance good to eat, was a fatt Ligament, very white and delicate, about two Fingers thick, which was on the in-ſide of the Paws and Feet; and it is queſtionable, whether it be not probable that there may proceed ſome moiſture from this Part, which has occaſioned *Ælian* and *Pliny* to ſay, *that the* Bear *Lives Forty Days by licking only its right Foot.*

The Claws of the two *Bears* which we diſſected, were faſtened to the laſt *Phalanx* of the Toes after the ſame manner as in the *Lyon*, having by the particular Structure of this Article or Joynt, which we have deſcribed in the *Lyon*, the Faculty of holding its Claws elevated in its March to preſerve the Points thereof; but it appeared that our *Bears* had neglected to uſe this Faculty, becauſe that their Claws were half worne away. They were *Black*, and much leſſer than in the *Lyon*, as might be judged by what remained. The manner how theſe Claws were worne, demonſtrated that their Subſtance was very different from that of the *Lyon*; for in the *Lyons* which we diſſected, the Claws were alſo ſomewhat worne on one Paw, but as fibrous Wood would wear; whereas thoſe of the *Bear* were like Iron: That is to ſay, that the Claws of the *Lyon* are compoſed of ſeparable fibres, by reaſon that they are of an *Heterogeneous* Subſtance, and that the Claws of the *Bear* are of a more even and more compact Subſtance.

The Teeth were like to thoſe of the *Lyon*, ſave that they were much leſs. Therefore it is ſaid that it uſes only its Paws to break the Netts and rend the Snares of the Hunters, becauſe that the bigneſs and thickneſs of its Lipps hinders it from uſeing its Teeth. Theſe Lipps have alſo a very extraordinary ſhape, the lower ones being wrinkled, and cut from the two corners like a *Cock's-Combe*.

The length of the whole Body, from the end of the Muzzle to the end of the Toes, was eight foot three inches; Five Foot and a half to the begining of the Taile, which was Five inches; and one foot five Inches to the hinder part of the Head, which was flat and made an angle with the bones of the fore-part Direct from the *Sutura Lamdoides*, at the middle of which abutted a *Crest* elevated like that of an Helmet, but much leſs than on the *Lyon*; and from whence the *Crotaphitæ*, which did Likewiſe Cover the head, did alſo take their original, being a great deal leſs fleſhy.

The *Thorax* was larger than in the *Lyon*, and alſo very long, being compoſed of fourteen Ribbs. The Neck was not Short in proportion to its breadth like a *Hoggs*, as Authors do report: for it had ſeven inches in breadth, and Nine in length: the great thickneſs of the hair which ſurrounds and inlarges this Neck, is that which makes it to appear ſhort.

The *Os Femoris* or Thigh-Bone was proportionably longer than it generally is in Brutes, and it was articulated with that of the Legg by means of a *Rotula*, which ſome Authors do ſay is found only in Man.

The Skin which was very hard and very thick on the Back, was found very thin and Delicate under the belly. The Hair was not ſo harſh and ſtuborn as in the *Lyon* and *Wild-Boar*, in ſome ſort reſembling Wool, more Frizled than the *Goats*, and much leſs than the *Sheeps*.

As for the internal parts of the Body, the *Epiploon* was very large but very lean, like all the reſt of the body, which neither on the inſide nor the outſide had one ſcrap of fat: which might be an effect of the diſtemper whereof it died, the natural conſtitution of the Animal being to be very fat, and the *Winter* being the Seaſon in which it grows fatteſt.

The *Liver* was vaſtly great, and divided into ſeven *Lobes*, one of which was much leſs than the reſt. The *Cyſtis fellea* was not half ſo big as in the *Lyon*: yet there was much gall diffuſed on the membranes of the circumjacent parts.

The *Oeſophagus* which exceeded not fourteen lines in diameter, and inlarged not it ſelf towards the ſuperiour orifice of the Ventricle, was outwardly very fleſhy to the Ventricle, which was extreamly ſmall, although *Ariſtotle* affirms that the *Bear* has it very large as well as the *hogg*. Which he ſays (perhaps) with all other Authors, becauſe that they have thought that the *Bear* being a great feeder, muſt needs have a large Ventricle. In our Subiects it was not a foot in length, and its greateſt breadth, which was towards the Top, exceeded not Six Inches, and two and a half towards the middle, where it was contracted to inlarge it ſelf again in a ſecond Ventricle about three inches and a half, which was raiſed towards the *Pylorus*. The bottom of each Ventricle was hard and three lines thick, and five towards the *Pylorus*, which was alſo harder: Their internal Membrane was even, as it uſually is, except that little roughneſs which we call the Velvet : But it ſomewhat reſembled that of the Ventricle of Animals which Chew the Cud, by reaſon of ſeveral Eminencies which it had, like to thoſe which do make the *Reticulum* and *Echinos* ; but that theſe Eminencies had not in their ſhape the regularity which is obſerved in thoſe Animals,

As to the *Inteſtines*, it may be ſaid that there was but one, becauſe there appeared not the diſtinction which is obſerved in the generality of Animals, by the difference of their Colour, Subſtance, and Bigneſs. There was not likewiſe any ſign of the *Cæcum* nor its *Appendix*, no more than of the Wrinkles, or Cells at the *Colon*. They were in all Forty Foot long : Where as thoſe of the *Lyon* exceeded not Twenty five. This Uniformity of the Inteſtines may have been the cauſe of *Theodorus Gazas* putting, in the Tranſlation of *Ariſtotles*' Book, where he Diſcourſes of the *Inteſtines* of the *Bear*, the Singular *Inteſtinum* for the Plural Ἔντερα ; and it is probable that this particularity was unknown to *Scaliger*, when he reproved *Theodorus* for taking this Liberty.

The *Spleen* was ſmall and thin, being not above ſix Inches long to two broad, and leſs than one thick.

The Structure of the *Kidneys* appeared to us very excellent and particular. Their figure was very long. They were five Inches and a half in length, and two and a half in breadth. The *Membrana Adipoſa*, which was without Fat, being taken away, there appeared another very hard and very thick Membrane, which was not the peculiar one, faſtned to the *Parenchyma*, but a Membrane which like a Sack contained fifty ſix ſmall *Kidneys*, for they may be called ſo many *Parenchyma* actually ſeparated from one another, covered with their proper Membranes, and joyned together in ſome places by Fibres and very thin Membranes, which were produced from that which inveloped them like a Sack. This connexion was principally of the little *Kidneys* which are in the Hollow part of this whole heap of *Kidneys* ; For towards the Gibbous part, they were not linked together.

The figure of each little *Kidney* repreſented a large Baſis on the out ſide, and were preſſed together towards the inſide of the whole *Kidney*, where they were faſtened like a Bunch of Grapes. This *Baſis* was in ſome Hexagonal, in the moſt Pentagonal, and in others Four-ſquare. They were alſo different in Size ; but in the greateſt part it was about the bigneſs of a middleing *Cheſtnut*, in ſome of a ſmall Nutt. This Heap did repreſent a *Pine-Apple*, when Ripe.

Each of theſe little *Kidneys* was faſtned, as it were by a Tail compoſed of three ſorts of Veſſels, which are the Branches of the two *Emulgents* and the *Ureter*, which entered thro' the Point of the little *Kidney*, which made a dent to receive them, as an Apple receives its Stalk, after the uſual manner of the great *Kidneys*. Theſe Branches were diſpoſed ſo as that of the *Artery* was between that of the *Vein* and that of the *Ureter*, as *Riolanus* has obſerved, who beleives that theſe Veſſells are thus ſeated, to the end that the *Artery* ſtrikeing upon the *Ureter*, may Inceſſantly cauſe the *Urine* to run by its continual beating.

The *Truncks* of the *Emulgent Vein* and *Artery*, which were not bigger than a Quill, were each divided into two Branches, and afterwards into ſeveral others, to Furniſh and add one to every little *Kidney*, though there were ſometimes two which ſeemed to be faſtened as it were to one ſingle Tail. But that appeared ſo, by reaſon that the two Branches which faſtened them together did enter into the little Kidney preſently after the Diviſion. Theſe Branches penetrated a little farther, and loſt themſelves in the *Parenchyma*, ſo that the notable Cavity which the Veſſel had when out of the little Kidney quite diſappeared; whether that happened by the almoſt infinite, and conſequently imperceptible diviſion, which is made in the little Branches, which diſperſe themſelves through the *Parenchyma*, as *Laurentius Bellius* thinks it happens to the *Emulgents* of the Kidneys of Man; or that indeed theſe Veſſels do not paſs farther, according to the Opinion of *Higmorus*, and that the ſpongious Subſtance of the *Parenchyma* preſently ſucks up and filtrates the Blood of the Artery, to render it to the Vein pure, and ſeparated from its ſeroſity, which runs through the *Papillæ* into the *Pelves* of the *Ureter*, like as *Whey*, when the Cheeſe curdles, leaves the buttery Part, and paſſeth through the Cheeſy part; and even as the Lye which is poured upon the top of the Copper comes through the hole below, after haveing penetrated the linnen, without any Pipes which do carry and convey it thither.

The Formation of the *Ureters* was different from that of the *Emulgent* Veſſel: For a little after its enterance into the Membrane, which like a ſack ſhut up all the little Kidneys, it was inlarged, and its bigneſs which was about the ſize of a Quill, increaſed equall to that of a finger. It was afterwards divided into two branches of this ſame bigneſs, which produced others leſſer, which ſupplyed a leſſer to every little *Kidney*. This laſt Branch did never the leſs ſurpaſs in bigneſs the Branches of the *Emulgent Vein* and *Arterie*, which entered with it into the little *Kidney*, and it paſſed forwarder, and nearer to the middle, at which place it was divided into two, and ſometimes into three branches. Every of theſe Branches inlarged it ſelf a little, and at its extremity formed a *Pelvis*, which was filled with a *Caruncle* like a Nipple; and at the ſide of this Caruncle the *Pelvis* appeared pierced with three or four holes, which were only Sinuoſities formed by the Membrane of the *Pelvis*, which was wrinckled on the in-ſide, making as it were other leſſer *Pelves*, capable of receiving only the head of a Pin. Theſe *Papillæ* or Nipples, which were no bigger than a Grain of Wheat, exceeded in their Number thoſe of the *Papillæ* of an Ox's Kidney, which are as large as the end of ones Finger, but which are not in Number above Nine or Ten, whereas there was above a Hundred in every one of the Kidneys of our *Bear*: And it ſeems that *Bartholinus* had not examined this, when he writt that the Kidney of the *Bear* was like to that of the *Ox*, of New-born Infants, and of a *Porpoiſe*, which he diſſected before the King of *Denmark*; for theſe Kidneys of which *Bartholinus* ſpeaks, and to which he compares thoſe of the *Bear*, have only ſlits in their Superficies, which makes them to appear at the firſt ſight like unto thoſe of the *Bear*, although in truth they have but one ſimple and continued *Parenchyma*, theſe ſlits penetrating not very deep; whereas the Fifty ſix ſmall Kidneys of the *Bear* were actually divided, and had every one all the parts of which the great Kidneys are compoſed.

It muſt be alſo, that thoſe who like *Pliny* have reported, that the *Penis* of the *Bear*, ſo ſoon as it is Dead, grows hard like a Horn, have not ſeriouſly examined the Matter, and that they have not had either the Courage to inform themſelves, which is the *Penis* of the *Bear* when alive, or the curioſity of diſſecting one when dead; for they would have found that this hardneſs is natural to this part in the *Bear*, as in the *Dog*, *Wolfe*, *Squirrel*, *Weaſel*; and ſeveral other Animals, which have a Bone at the end of the *Penis*, as *Ariſtotle* obſerves. That of our *Bears* was five Inches and a half long, four Lines broad towards the *Os Pubis*, from which it was five Inches diſtant, and a little bended.

The Lungs had five Lobes, three on the right ſide, and two on the left. The two upper on the right ſide were very large; the third which was middling, was divided at its extremity into three Points. In one of our *Bears*, the two Lobes of the left ſide were exceedingly ſwelled; the ſuperior which appeared whiteiſh, was puft up with a great deal of Wind: In the inferiour there was found a ſtrange Body twice as big as ones fiſt, like to a Spunge ſteeped in Ink. In the other *Bear*, which was very young, the Structure of the *Mediaſtinum* was very particular, being pierced in ſeveral places with a great many holes of a Line and a half in breadth, and being interſperſed with a great number of Veſſels, which were above a Line in thickneſs, ſo that it wanted only the Fat to reſemble an *Epiploon*.

The Heart which was ſix Inches long and four broad, was very ſolid at its Point, the Fleſh whereof was an Inch thick; this Point was blunt and not ſharp, as in the *Lyon*.

The *Aſpera Arteria* had all its rings imperfect, and not intire as in the firſt of the *Lyons* which we diſſected: But theſe Rings in our *Bears*, were much larger than in the *Lyon*, being above five Inches in the Circumference.

The Tongue was broad and thin, as in the *Cat* and *Dog*, and furniſhed at top with its little fleſhy Points without any roughneſs.

The *Cranium* or Skull was not ſo brittle as Authors do report; it was found very hard under the Saw. It is very true that it was not above half the thickneſs of the *Lyons*; which we found to be ſix Lines at the thinneſt place. The Bone which advanced on the in-ſide, and which ſeparates the *Cerebrum* from the *Cerebellum* was alſo thinner, and of a more irregular ſhape than in the *Lyon*.

The Brain was in recompence four times as big, being four Inches in length, and as many in depth, to three in breadth; whereas the *Lyon* had but two every way. The *Glandula Pinealis* was very little, and almoſt imperceptible as in the *Lyon*.

The Eye was covered over with an internal Eyelid, which began at the great *Canthus* or corner tending ſomwhat down wards. It was ſtrangely little: Its *Ball* was not above Five Lines Diameter, and was leſſer than that of a *Catt*. The *Chryſtallinus* was almoſt ſpherical; and that of the left Eye of the greateſt and oldeſt of our *Bears* was ſpoiled by a *Glaucoma* which had made it white, and altogether opake, its ſituation was likewiſe very extraordinary, not being directly placed over the Aperture of the Uvea but drawn a ſide out of the *Axis* of the Eye, ſo that even before the deſſection this was found out by a whiteneſs which appeared at the bottom of the aperture of the *Pupilla* in the inſide, as if there had been a Cataract couched: and this was cauſed by the contraction of the Fibres of the *Ligamentum Ciliare* of one ſide, and by the extenſion or relaxation of thoſe of the other; which ſeem'd to be made to leave a free paſſage for the uſual Species through both the other humours;

this distortion of the *Cryſtallinus* being probably cauſed after the ſame manner as it is ſeen to happen to the eyes of Children, which haveing been a long time couched in one place where they can only diſcern the light obliquely, do grow a ſquint by a diſpoſition which the muſcles of the eye do contract by uſe, and which changes that which is naturall to them, by the extenſion of the fibres of ſome, and by the contraction of others. This would make us to think that theſe Fibres of the *Ligamentum Ciliare* are capable of a contraction and voluntary dilatation, like to that of the Fibres of the muſcles ; and that this action may augment or diminish the convexitie of the *Cryſtallinus*, according as the need which the different diſtance of the objects may make it to have on the Eye to ſee more clearly and diſtinctly.

The extream leanneſs of our two *Bears*, deprived us of the means of making an experiment on their Fat, and of informing our ſelves of the truth of what *Ariſtotle*, *Theophrastus*, and *Pliny* do report thereof; that being kept all winter, it manifeſtly increaſes in bulk and weight ; which being verified would confirm the current opinion, that the *Bear* is of all Animals that in which the Facultie of growing is moſt powerfull; ſeeing that being at the begining of Life almoſt the leaſt of all (for according to the report of *Ariſtotle*, and *Pliny*, it is hardly bigger then a *Ratt*,) yet it grows one of the greateſt: and that though it hath been a long time ſuckled and feed with milk from a damme which eats nothing, (if it be true as *Ariſtotle* ſays, that the *Bear* brings forth its Cubbs when it is ready to ſhut up it ſelf in its Den, where it remains forty days without eating, and that afterwards the *Bear* dos annually continue a long ſpace without takeing Nouriſhment,) it ceaſeth not to grow ſo powerfully that according to *Albertus* , its growth like the *Crocodile's* laſts the whole courſe of its life, and continues even after its death, if what the ancients have writt concerning its Fat be true .

The Conſideration of theſe particulars joyned with our Obſervations, made us to think that the Temperament of the *Bear*, which according to *Ariſtotle* is extreamly Humid, muſt be underſtood of an Humidity peculiar to Life, which is that which dos not eaſily dry, and which is the effect, not of the Crudity, ſuch as is the ſuperfluous Humidity of the Excrements, but of the perfection of the Concoction cauſed by the goodneſs of the Conſtitution of the parts, which are capable of eaſily Converting all kind of Nouriſhment into good Juice, and of aſſimilateing and changeing it into their proper Subſtance, or of diſſipating the greateſt part thereof by the Imployment which they do advantagiouſly make of it for the exerciſe of their Functions.

The Remark's, which our Obſervations on the *Bear* have afforded us of this perfection of Temper, are firſt, that an Animal which Eat's indifferently of all ſorts of Meat like the *Bear*, and which with the ſame Facility Digeſts raw Meats, *Fiſh*, *Crabs*, *Inſects*, *Fruits* of *Trees*, *Pulſe* and *Hony*, and that in a very ſmall Stomach, and ſtrait Inteſtines, and amongſt which there is found no *Cæcum*, muſt have a Wonderful Power for the Concoction; ſeeing that it is capable of ſupplying by the goodneſs of the Temper, that which is wanting in the Commodiouſneſs of the Structure, which is found in the Organs which other Animals have to render theſe functions more perfect, and which to Digeſt a great deal of Nouriſhment, do keep it a long time in great Receptacles, and Convey it through a vaſt many wrinkles and anfractuoſities, as we have Obſerved in the *Camel*, whoſe Inteſtines were almoſt as long again as thoſe of the *Bear*, comprehending above eleven *Toiſes*.

Secondly, the ſmall capacity which is found in its Liver and Spleen to receive the Excrements, denotes alſo that the action of the Natural Heat is ſo well regulated, that it is not Subject to the Defects or Exceſſes, through which the Food being either Burnt, or but half Dreſt, the Bloud which is thereby ingendered hath need of being Purged and Cleared of abundance of parts which are incapable of Nouriſhing the Body. For as to the great Number of *Kidneys*, when even Nature had made it to Evacuate a greater quantity of Seroſity, the abundance of this Excrement ought not to be Eſteem'd a Sign of the weakneſs of the Heat, and imperfection of the Concoction; but rather an Effect of the little inſenſible Tranſpiration which is made in the *Bear*, by reaſon of the thickneſs of the Habitt of its Body, which is not favourable. To which we may likewiſe add, that this want of Tranſpiration cannot be a Sign of the want of Heat, and of an Earthy weight; ſeing that how Maſſe, and Groſs ſoever the *Bear* appears, there is ſcarce any Animal whoſe agility and vigour is more capable of ſhewing the abundance and Subtilty of Spirit which the power of Natural Heat is uſed to produce.

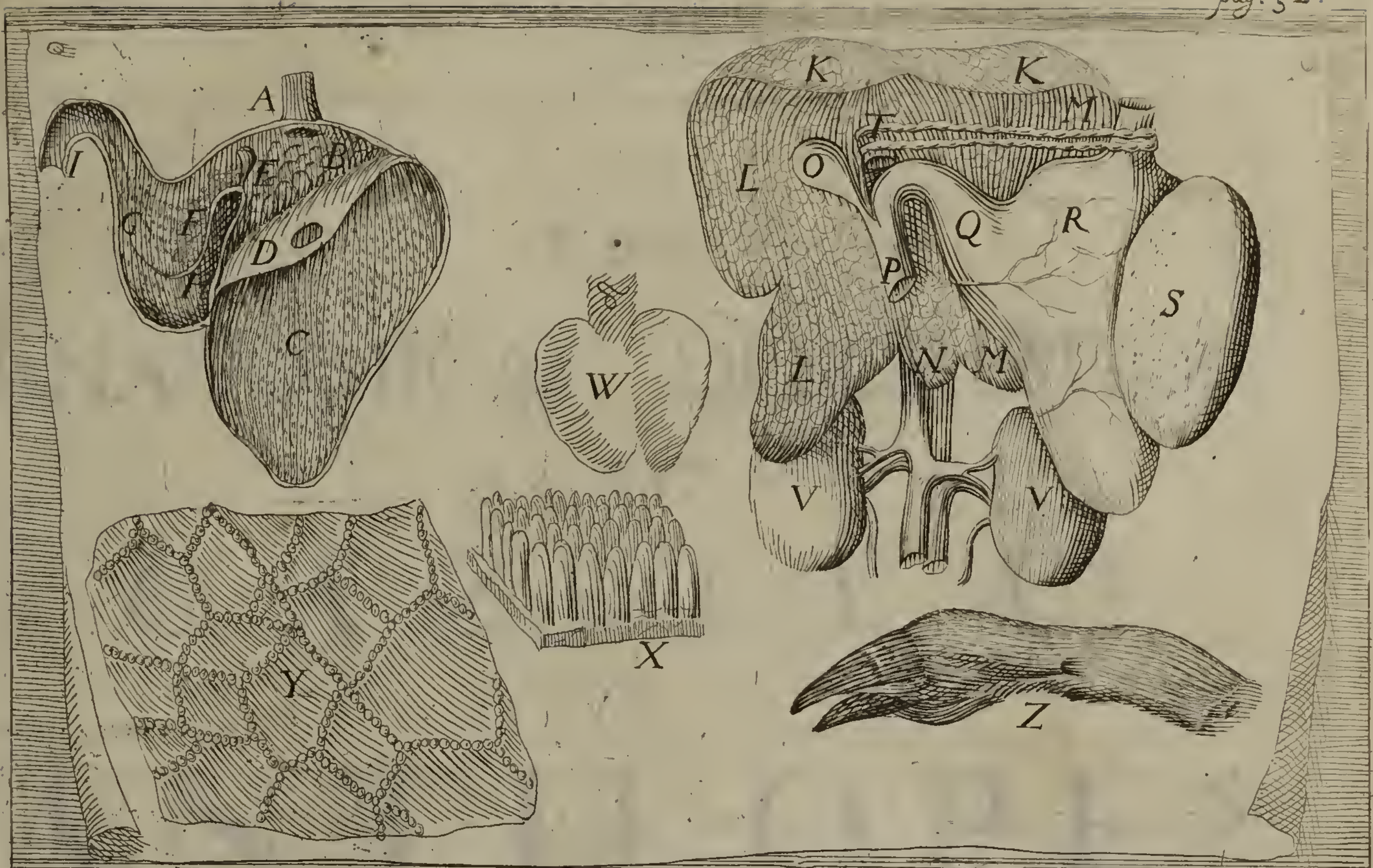
Thirdly, this ſo Powerful faculty which it has of growing, is the mark of a very perfect Humidity, ſeing that it renders the parts capable of extending themſelves, and ſo of Augmenting their Grandure, without the leaſt diminiſhing of their forces. The Conjectures which we have drawn from our Obſervations, to make credible this extraordinary ſmallneſs reported by Authors of the *Bear* at its Birth and firſt Conformation, are grounded upon the littleneſs of its Eyes, by reaſon that the Eyes when the Formation is apparent, are commonly ſo bigg in Proportion to the reſt of the Body, that each Eye ſurpaſſes in bigneſs all the reſt of the Head, like as the Head do's vaſtly Exceed the bigneſs of the reſt of the Body: ſo that ſuppoſing as it is rational, that the Eyes of the *Bear* were in the firſt Formation Proportionably as large to the reſt of the Body as they have uſed to be, it is eaſie to Judge by the littleneſs which they have when the *Bear* is arrived at its growth, what was the ſmallneſs of its whole Body in the firſt Formation; or elſe it would be to ſuppoſe a thing incredible, *viz.* that its Eyes have not grown and increaſed proportionably to the reſt of the Body, as in other Animals.

The Explication of the Figure of the Gazella *or* Antilope.

That which is diſcribed in the lower Figure has no Black liſt, which ſeparates the Fawn-colour of the Back from the White of the Belly, and the Knees of the Fore-leggs are not bare and Hair-leſs; becauſe that theſe are Particulars which were wanting in Four of the *Gazella's* which we diſſected. There was one alſo, which was the Male, whoſe Horns were more bent towards the Back than they are in this.

In the Upper Figure.

A. *The* Oeſophagus.
B. *The middle Membrane of the great* Ventricle.
C. *The internal Membrane.*
D. *This Membrane ſeparated, to diſcover the part underneath.*
E. *The* Valve *which ſhuts the ſecond* Ventricle.
F. *The firſt part of the ſecond* Ventricle.
G. *The lower part of the ſecond* Ventricle.
H. *The Sack of the ſecond* Ventricle.
I. *The* Pylorus.
KK. *The Gibbous part of the Liver raiſed up.*
L L. *The right Lobe.*
MM. *The Left.*
N. *A Little Lobe which is in the middle.*
O. *The Gall-Bladder.*
P. *The* Duodenum.
Q. *The* Pylorus.
R. *The outſide of the* Ventricle.
S. *The Spleen.*
T. *The Two* Lymphaticks.
V V. *The Kidneys,*
X. *Part of the Membrane* B, *ſeen with the* Microſcope.
Y. *Part of the Membrane* C, *ſeen with the* Microſcope.
♂. *The laſt Bone of the* Sternum.
W. *The* Cartilago Xiphoides.
Z. *One of the Feet.*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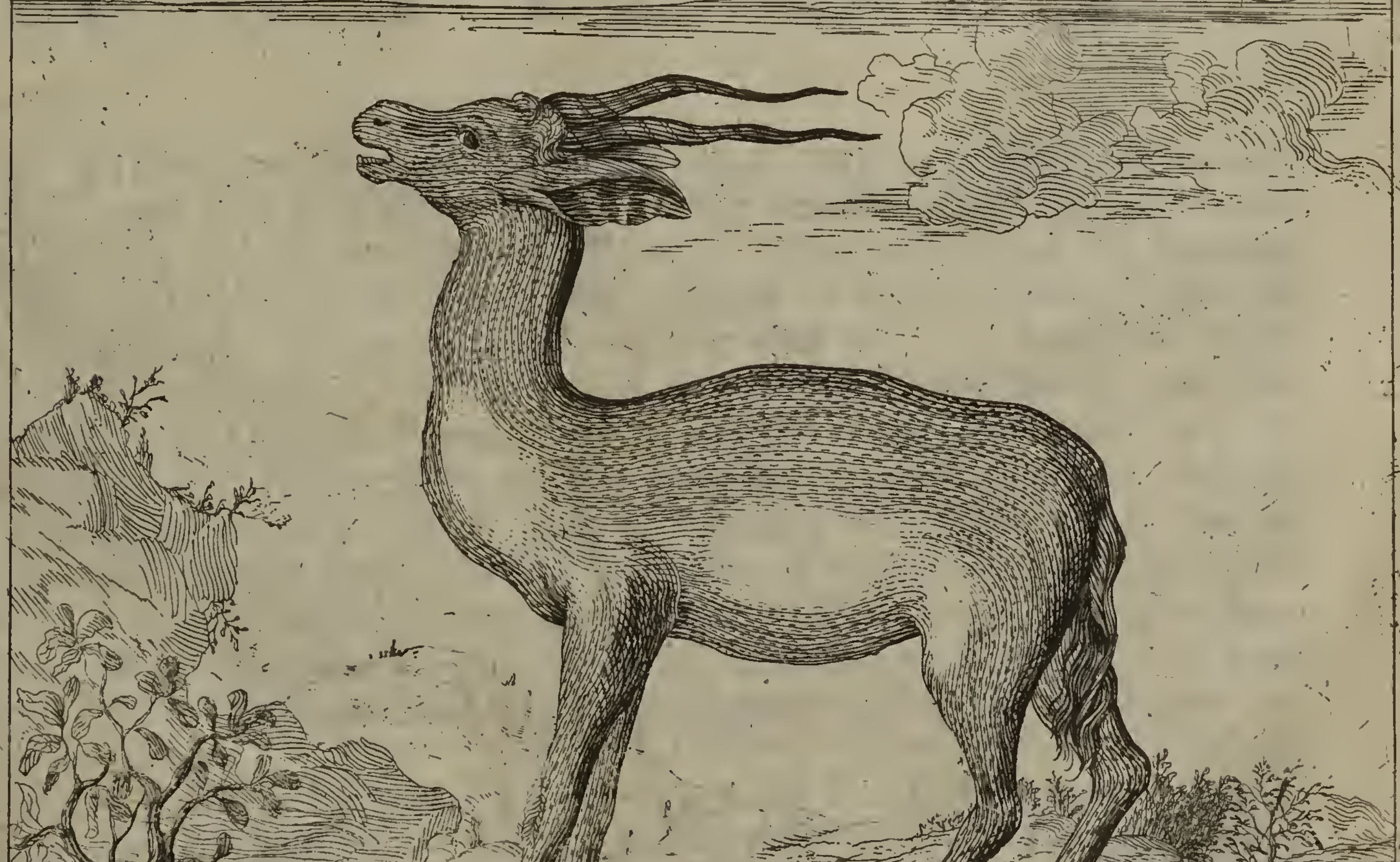


THE
ANATOMICAL DESCRIPTION
OF FIVE
GAZELLA'S
OR
ANTILOPE'S.

THe five *Gazella's* or *Antilope's* of which we do give the Deſcription, were brought to us at divers times. There was one Male, three Females, and a Fawn, which was likewiſe a Female. The firſt which we diſſected, which was the largeſt and oldeſt, was brought us with its Fawn, from the Park of *Verſailles*, where it was told us, that they had been both killed by another Male *Gazella*. We found that the left Shoulder of the Damme was all bruiſed, and that the Fawn had three Leggs broken. This made us to reflect upon what *Belonius* ſays, *that the* Gazella *is the* Oryx *of the Antients,* which *Oppian* repreſents as an Animal ſtrangely fierce and cruel: But we found not the other Marks, which according to Authors are peculiar to the *Oryx*; *as to have one ſingle Horn in the middle of the Fore-head*, as *Ariſtotle* ſays; *to have all the Hair turned towards the Head*, according to *Pliny*; *to have a Beard on the Chin*, as *Albertus*; *and to be ſtrong enough to Fight* Lyons *and* Tigers, *as* Oppian *relates.*

Our *Gazella's* had a very mild carriage, and it is ſaid that theſe Animals grow not angry, unleſs when touched on their Horns. The *Arabian* Authors do call the *Gazella Algazel,* that is to ſay, a *Goat*; and it is moſt probable the *Dorcas,* or *Lybick Goat*, which is no other but the *Strepſiceros* or *Wild-goat* of *Ægypt*; although *Scaliger* pretends, that the *Strepſiceros* is a Species of *Sheep. Ælian* Reports, that the *Lybick Dorcas* is light of Foot, that its Belly is White, and the reſt of the Body of a Fawn-colour; that the White and Fawn-colour along the Flanks is ſeparated with a Black Liſt; that it hath Black Eyes, and huge great Ears. The *Strepſiceros*, according to *Pliny* is an *African Goat*, which hath the Horns elevated on the Head, very pointed, round incompaſt round with ſeveral wrinkles, and bended like the Branches of an Harp; or rather as *Joannes Cajus* underſtands it, that they are bent ſometimes outwards, and ſometimes inwards, ſo that they do deſcribe the *Profile*, and wreathing of a *Guitterne*: But it may be queſtioned whether the *Lyræ* of *Pliny*'s Time were of this Form.

All theſe Marks being found in theſe five Animals which we diſſected, it may be ſaid, that the *Strepſiceros*, *Dorcas*, and *Gazella* are the ſame thing; for our *Gazella* is an Animal of *Africk*, which ſeems to be a good Runner, if it may be gueſſed by the length of the Leggs. It was about the bigneſs and form of a *Wild-Goat*, with Fawn-coloured Hair, except the Belly and Stomach, which were White, the Tail which was blackiſh, and a Liſt ſomwhat more Black, like as the reſt of the Hair from the Eye to the Noſe. The Hair better reſembled that of a *Wild-Goat*, than that of a tame one, being very ſhort: Under this Hair the Skin was perfectly Black, and ſhining in that which was the oldeſt; in the others it was Grayiſh; and this Blackneſs appeared very plainly in their Ears, which were large and not hairy on the in-ſide, where the Skin was Black and ſmooth like *Ebeny*, having only ſome ſtreaks of Hair very White, more ſtubborn and longer than that of the Belly; Theſe ſtreaks or rows proceeded from the bottom of the Ear, and grew larger towards the Edges. The Eyes were large and black; the Horns were likewiſe Black, radiated croſs-wiſe, fifteen Inches long, ten Lines broad at the Bottom, very pointed, pretty ſtrait, but ſomewhat turned outwards towards the middle, and which did afterwards bend inwards again, according to the ſhape of the Branches of an Harp, ſuch as is ſeen in ſome Ancient Sculptures. Thoſe of the Male were a little more bent backwards. In the Four Females they were round, but the Male had them ſomewhat compreſſed and flatted, which hindered them from being perfectly round; and it may be ſaid that this roundneſs of the Horns has given to the *Gazella* amongſt the Ancients the Name of *Strepſiceros*, which muſt rather ſignify Horns wreathed about, than bent as thoſe of all other *Goats* uſually are; this one ſort of roundneſs being peculiar to the Horns of the *Gazella*, amongſt the *Goat-kind*, (ſuppoſing it to be a Species of *Goat*) becauſe that the other Horns of theſe Animals are of Angles and Planes, like thoſe of all Sheep, except that of *Candia*, which hath round Horns, as *Belonius* obſerves, who ſays, *that even in his time it was in the Country called Stripſoceri*; which might well be the reaſon that made *Scaliger* to ſay, *that the* Strepſiceros *is a kind of Sheep*.

Theſe Horns were hollow half way, and filled with a pointed Bone, which faſtened them to the Head by the means of a *Pericranium* which covered it. This *Pericranium* was very hard, thick, and moiſtened with a great deal of Blood, like as the in-ſide of the Bone, which was ſpongious like the *Diploe*: The external Superficies of the Bone being very ſolid, and ſtreaked with ſome Furrows according to its length, contrary to the Furrows of the Horns, which were tranſverſe, as hath been declared. At the root of theſe Horns there was a Tuft of Hair longer than that of the reſt of the Body.

The Noſe was a little flattiſh like to the *Goats*, but yet more in the Male than in the Females, for its Noſe was ſhorter, as it uſually is in the generality of Brutes, where the Males have the Head always rounder than the Females.

The Palate was covered over with a very hard Skin, like long Scales. The *Dentes Inciſores*, which were wanting in the upper Jaw, becauſe that this Animal chews the Cud, were eight in the lower Jaw, very keen and of an unequal ſize; the two foremoſt being as large as the other ſix whoſe breadth went taper-wiſe, and being likewiſe a great deal larger at either end than towards their Root.

The Tail in the Females had long and Blackiſh Hair. It was flat at its Origine, and about two Inches large towards its firſt Knotts, and was contracted and reduced to one, at the place where there grew long Hair which hung down to the Hammes. The Tail of the Male had not this long Hair which in all the Females reſembled that of a Mans Head; it was only a little longer than that of the reſt of the Body and ſofter than that of the Tail of the Females.

The Fore-leggs upon the bending of the Knee were covered with Hair ſomewhat longer, and harder than on the reſt of the Legg. It was layd and turned half on the right ſide, and half on the left, like the feather of a *Horſe*; and in this place the Skin was a great deal thicker than elſewhere; which made it a kind of a little Cuſhion to kneel on, like the Calloſities which are on the Knees of the *Camel*. The *Gazella* which *Fabius Columna* deſcribes, better reſembled the *Camel* than ours, for it had this place wholly deprived of Hair.

The Foot, which was a great way Cleft and fortified with two great Hoofs, beſides the two little ones at the Heel, like the foot of the *Wild-Goat*; had this alſo reſembling the feet of the *Camel*, that it reſted half upon the Hoof, which only fortified the forepart, and half on the Skin, which in the hinder-part covered a round, and much thicker Fleſh than is on the Feet of *Staggs*, *Wild-Goats*, and other Animals which have Cloven Feet. And this Fleſh is probably more fitt to walk upon the Sands of *Lybia*, than on the Lands of other Countrys which are Stony, as we underſtood by the Feet of one of our *Gazella's* which was much ſwelled, for having been hurt in this tender part unprovided of a Hoof.

We Obſerved alſo that theſe Feet are Cleft after a particular manner, becauſe that the two Hoofs, which might be moved a great way from one another, were joyned by a Skin which was very eaſily extended: Which made us to doubt whether the *Gazella* might not be the Animal which *Ælian* reports to be by the Greek Poets called *Kemas*, to which he gives a great many Marks which are ſeen in the *Gazella*, but amongſt other things he ſays that its Feet, which are like to thoſe of a *Goat*, are ſo Formed that they do help it to Swim. This Skin was ſhorter in the Feet of the Male, whoſe Hoofs opened not ſo much as in the Feet of the Females.

Our *Gazella's* had but two Teats, which had each but one *Papilla*. On the ſide and underneath the Teats there was in the *Inguina* or Groins two Cavities like Sacks not very deep, where the Skin was without Hair, as it is about the *Papillæ*; but this Skin was not ſo ſleek, being rough and like a Barley-Corn. Theſe Cavities were filled with a Subſtance like Wax: Which may have occaſioned the miſtake of *Ioannes Agricola Ammonius*, who has taken the *Civet-Cat* for a *Gazella*, by reaſon of the Baggs which the *Civet-Cat* has to contain its Sweet Smelling Liquor; the *Civet-Cat* and *Gazella* being otherwiſe Animals altogether unlike, and theſe Cavities or Sacks which are ſeen in the *Gazella*, do much more reſemble thoſe which *Hares* have in the ſame place, than thoſe of the *Civet-Cat*. The Male had theſe Cavities or Sacks as well as the Females.

All theſe Particular Circumſtances which we obſerved in theſe Females, were only in three of our *Gazella's*; the fourth differed from the reſt, in that it had no Cuſhion on the Knees, although the others much Younger had it; but it had not this place bare like that of *Fabius Columna*, which it otherwiſe reſembled, by reaſon that it had this Black Liſt along each Flanck, which *Ælian* has obſerved in the *Lybian Dorcas*: The Male had alſo this very Liſt.

As to the internal Parts, the *Epiploon* in all the five *Gazella's* was furniſht with a hard and Rediſh Fat, which covered and incloſed almoſt all the Veſſells which are in this Part, by following and accompanying them into all their diviſions. This *Epiploon* Swam not upon the *Inteſtines*, but Inveloped them behind, except in one of our Subjects in which towards the left ſide the *Ileum*, was faſtned to the *Peritonæum*, by a great Number of Fibres. In the others it deſcended from the anteriour and middle part of the Ventricle to which it was faſtned; and paſſing into the bottom of the lower Belly, under the greateſt part of the Inteſtines, came to faſten it ſelfe to the Center of the Meſentery, and Aſcending higher, returned to the lower Part of the Ventricle. The *Cartilago Xiphoides* was four times bigger in Proportion than it is in other Animals, being an Inch and half in Breadth, and ſpreading out of each ſide of the *Sternum* to which it is faſtned, and turning it ſelf round to end in a double obtuſe Point. The Liver, as to its Figure and Shape, was very like to a Mans, being divided into two great Lobes, beſides which, there were two leſſer, one whereof, which was the leaſt, was extended to the right Kidney, which it half covered; the other was in the middle upon the Spine. In the hollow part of the *Fawn's* Liver there were two Lymphatick branches about the bigneſs of a Line. They appeared as it were very full of knotts, by reaſon of the inequality which an almoſt infinite Number of *Valves* afforded them in the contracting them; ſo that like little Beads of *Chryſtall* they faſtned the Trunck of the *Vena Porta* to the ſupriour *Orifice* of the *Ventricle*.

The Subſtance of the Liver appeared to us very particular, being as it were compoſed of an infinite Number of little Glands, ſome bigger, and others leſſer then *Hemp-ſeed*. They were of a much paler Red than that which joyned them together. Theſe Glands ſeemed every one pierced thro the middle, by reaſon of a little Red ſlitt which they had, out of which there came bloud when they were preſſed. That which parted them one from the other was of a Red like to that of the ſmall ſlits, but this part did not bleed. The Glands of the hollow part were much larger then thoſe of the Gibbous.

Dr. *Malpighius* a Phyſitian of *Meſſina*, who is of opinion that all the *Parenchyma's* are compoſed of ſeveral *Glands*, explains not how he obſerved that the Livers, which do generally appear of a continued and Homogeneous Subſtance, are indeed divided into ſeveral parts ſeparated from one another, nor of what bigneſs they are: for when he ſays that theſe Glands do reſemble Grapes, upon the bunch, it may be doubted whether theſe Grapes do ſignifie the figure or bigneſs of the Glands, which he neuertheleſs own's to be Hexagonal in the Liver of *Cats*, and different in every Animal.

We were of opinion that it might be, that the Glands which did compoſe the *Livers* of our *Gazella's* were grown apparent by ſome Diſtemper, becauſe that they were much more viſible in ſome than in others, and that there was one of our *Gazella's* where theſe Glands appeared not at all, and in which the Liver was found with a *Parenchyma* even homogeneous, and continued as uſually; ſo that there is ground to believe that theſe Glands, which when the Animal is in Health, are ſpongious and imbued with the Blood which is in all the *Parenchyma* of the Liver, do not ſeem to be ſeparated from one another, as they do appear, when being hardned by the Diſtemper, and by reaſon thereof receiving leſs Blood, their different Subſtance makes them more diſtinguiſhable, by the diverſity of Colour, which in the glandulous Part is whiter for want of Blood, and redder in that which is between the Glands, by reaſon of the Blood there contained.

But that which confirms *Malpighius*'s Opinion, is the regular Figure which we have obſerved in theſe Glands, which is always near the Hexagonal, and the little chincks or ſlits which all had in their middle: for that demonſtrates, that it is not when the Liver is hardned by a Schirrous and preternatural concretion of its Subſtance, fortuitouſly amaſſed into ſeveral Lumps, as it happens to Oyl when it is frozen, but that every Gland by condenſing has preſerved its natural Figure.

The *Spleen* was oval, very ſmall, all faſtened and joyned to the left ſide of the Ventricle, except about a Fingers breadth of the fore-part, which was ſeparated there-from; ſo that the Veſſels commonly called *Vas breve*, which are ordinarily the band which faſtens the Spleen with the Stomach, appeared not, being confounded and hid in the Membranes of one or other of the *Viſcera*. In all the five the Spleen was of a Violet-colour at top, Blew underneath, and all over ſpeckled with White Spots, which might be taken for Glands like thoſe of the Liver, were it not that they were of a regular ſhape.

The *Gazella*, which is an Animal that chews the Cudd, has but two Ventricles, which do appear very diſtinct and ſeparated from one another by conſiderable Contractions, ſuch as is ſeen in other Animals that chew the Cudd. But the truth is, that in our great *Gazella*, theſe two Stomachs were more diſtinguiſhed, than the four are in other Animals; for beſides the Contraction and different qualities of the Membranes, which do generally make the diſtinction of the four; there was a Valve which ſeparated theſe two, and in the Membranes which did compoſe them, we found all the various Figures and particular Subſtances, which the four uſed to have.

The firſt and largeſt which receives the Nouriſhment immediately from the *Oeſophagus*, was very ample and large at the top, and its Figure was pointed at the bottom. It was covered on the in-ſide with two Membranes layd one upon the other, which are thoſe, with which are ſeparately covered the two firſt Stomachs, which in *French* are called *Pance* and *Bonnet*. Theſe two Membranes were very eaſily ſeparated one from the other: The exteriour, which made the internal Superficies, which is that which is proper to the *Pance* or Paunch, called by *Ariſtotle* Κοιλία μεγὰλη, was like a Velvet compoſed of an infinite number of little Particles, having the form of *Papillæ*, which were three times as long as bigg; and this Bulk exceeded not that of a middle-ſized Pin. The other Membranes which were under this firſt is that which is proper and peculiar to the ſecond Stomach, by *Ariſtotle* called Κεκρύφαλος, and by the *Latins*, *Reticulum*, by reaſon that it has ſome Eminencies which do repreſent a little Net, which has made this Stomach to be called *Bonnet*, becauſe that this Net reſembles the lace Bonnet, in which Women heretofore incloſed their Hair. Theſe Eminencies like a Net were as it were ingrailed, and bordered with little grains.

This great *Stomach*, which we do reckon but one, becauſe that its two different Membranes were extended equally, and after the ſame manner one over the other through its whole Capacity, may nevertheleſs appear double, in that its ſuperiour part, which was much larger than the inferiour, was in ſome ſort ſeparated by a Contraction, but which was very inconſiderable.

At the top of this great *Stomach* towards the right ſide, where it contracted like a *Pylorus*, there was an Orifice or Aperture which was the paſſage to the ſecond; and this Aperture was cloſed by a Membrane, in form of a great Valve, made like a little Sack, to hinder that which is once got out of the great Stomach from re-entring therein. This ſecond Stomach, from its entrance to its middle, was like to the third of *Oxen* and *Sheep*, by *Ariſtotle* called Εχῖνος by the *Latins Omaſum*, and in *French Millet*, becauſe that it is full of leaves diſpoſed lengthwiſe, which are bordered with little Eminencies like grains of *Millet*, which appeared rough and full of points to thoſe who have given it its Greek name, which ſignifies an *Hedghog*. This roughneſs which went half way decreaſed inſenſibly and not all at once. The colour of this firſt part of the ſecond Stomach was likewiſe different from the firſt great Stomach, in that it was of a Red inclining to a Purple, whereas the firſt was white as uſually.

The ſecond part of this Stomach was much larger than the firſt, and it reſembled the fourth of other Animals that chew the Cud, called by *Ariſtotle* Ἤνυστρον, by the *Latins Abomaſum*, and by the *French Caillette*, becauſe that it is in this Stomach that the Runnet is made which makes the milk to curdle. It had alſo ſome inequalities and Eminencies like leaves, but which were ſmooth and poliſhed. Moreover it formed at its entrance a great Sack, by the means of a fold which it had underneath the firſt part of the ſecond Stomach; and towards its paſſage out it was raiſed upwards and contracted to make the *Pylorus*. This Structure of the two Stomachs which was found the ſame in all the Females, was ſomething different in the Male, where the firſt and great Stomach was not pointed at the bottom; and altho its two Membranes were ſeparable as in the Females, yet the under one had no Network folds, nor any Valve at the entrance into the ſecond Stomach, which had an Eminence or Bunch which was wanting in Females.

The *Inteſtines* of the Females were diſpoſed in ſuch a manner that the *Jejunum* and *Ileum* were plaited very ſmall through ſeveral little Cells, and faſtened along the *Colon*, which ſerved them as a band to ſtay theſe plaits or folds like a Ruff. The *Colon* had no Cells: The *Ilia* or ſmall guts were almoſt four lines diameter, and the *Colon* above ſix. The *Inteſtines* of the Male had their *Anfractuoſities* after another manner; for ſome were folded as the *Colon* in a Man, making a great many little Cells: others were doubled longways like a Trumpet, each fold being above four Inches long.

The branches of the *Venæ Meſaraicæ* were very large, and faſtened to the *Colon* by abundance of little branches which they ſent thither; and every great branch paſſing a little farther did in like manner diſtribute little branches to the Small Guts.

The *Cæcum* was ſeven inches in length and one in thickneſs.

The *Kidneys* were almoſt round: The right lay under the little right Lobe of the Liver, and the left under the Point of the Stomach. The ſituation of thoſe of the Male was very extraordinary; for the left was upon the *Aorta*, and the right was two Inches higher than the left.

At the Origine of the right Spermatick *Artery* of the Male, there was a Glandulous Body placed upon the Trunck of the *Vena Cava* as if it were a Cuſhion to this *Artery*.

The *Uterus* was divided into two *Cornua*, as in other *Brutes*. On the inſide it had abundance of Eminencies like *Papillæ*, ſeven or eight in each Horn; and at the Internal *Orifice* there was a *Caruncle* in the inſide which covered it.

There were two large Veſſels which went to the Duggs. The Vein which was the larger directly tended to the *Papillæ*, alwayes keeping its ſame bigneſs, and ſuddainly diſappearing, without caſting forth any apparent Branches. The *Artery* ran down to the Bagg which is near the *Papillæ*, where it was divided into five or ſix Branches, like a *Gooſes* Foot.

The *Lungs* had four Lobes on the right ſide, and two on the left. In one of the *Gazella's* they were all ſticking faſt one to the other, and to the Ribb, and *Diaphragme*, to which the Liver was ſo faſtned, that its *Parenchyma* was there tied, and would ſooner tare than ſeparate.

In this Subject the *Vena Azygos* was as large as the *Vena Cava*.

All our *Gazella's* had the Heart long, and Pointed, that of the largeſt being four Inches and a half in length, and two and a half in breadth. The Ventricles of the Heart of that which Dyed with the blow which had bruiſed the Shoulder, were almoſt filled with a hard and Solid Fleſh, which was a Body ſtrange, and ſeparated from the Subſtance of the Heart, and of its Veſſels. The *Pericardium* was imediately Knitt to the *Sternum* and *Diaphragme* by two ſtrong Ligaments. The Point of the Heart was turned towards the *Cartilago Xiphoides*.

The *Brain* had few *Anfractuoſity's*, and was but lightly ſlit, and divided in two, at the place of the *Falx*. The two upper *Ventricles* were open one into the other in the Anteriour part of the *Septum Lucidum*, by an hole two thirds of a Line in breadth.

The Ball of the Eye which was very large being an Inch Diameter, was covered with an internal Eye-lidd: The *Cornea* was Oval. The *Uvea* was of a Greeniſh pearl Colour, and the *Retina* was in this place Croſſed over by the Branch of a Vein which ſhot forth ſeveral Branches; The whole being full of a Blackiſh Blood. The Branch was about the bigneſs of a great Pin, and it was got into the thickneſs of the *Retina*.

The Explication of the Figure of the Cat-a-mountain.

IN the lower Figure it may be obſerved that this Animal is altogether like a *Cat*, except that it has proportionably a ſhorter Neck, and the Tail much leſs. In this it differs alſo from the *Leopard*, which has a Neck long and ſlender, and a very large Tail, as Naturaliſts do deſcribe it.

In the Upper Figure.

A A. *The bottom of the* Ventricle.
B B. *The* Vena Gaſtrica.
C C. *The Membrane which holds together the two Orifices of the* Ventricle.
D. *The* Spleen.
E. *The Trunk of the* Vena Cava.
G. *The Trunck of the* Aorta.
H. *The upper* Meſenterick Artery *miſcalled the* Lower *in the Text.*
I. *The Veins and Arteries of the Loyns.*
K K. *The* Ureters.
L. *The* Bladder.
M. *A Veſſel which may be taken for one of the* Deferentia.
n n. *The* Proſtatæ.
O O. *The* Kidneys.
P. *The* Penis.
Q Q. *The proper Membrane of the* Kidney.
R R. *Some Veſſels appearing on the outſide of the Kidney it ſelf.*
S S. *The great* Sinus's *in the* Os Frontis.
T T. *The two other* Sinus's *in the* Os Occipitis.
V V. *The Brain.*
X. *The* Cerebellum.

THE

THE ANATOMICAL DESCRIPTION OF A CHAT-PARD OR, CAT-A-MOUNTAIN

TIs thought that the *Chat-pard* or *Cat-a-mountain* is one of thoſe Animals which are ingendred by the mixture of two different Species, and that it ought to be put in the number of the Novelties which *Africk* daily produceth; according to the Opinion of *Ariſtotle*, who giving the reaſon of the Fertility which *Africk* has for *Monſters*, ſays that the dryneſs of its Deſarts compels the Savage Beaſts to Aſſemble at places where there is Water: And he ſuppoſes that this meeting occaſions theſe different Animals to couple, and ingender a new Species, when it happens that they are equal in ſize, and the time which they uſed to bear their young is not very different.

But according to theſe reaſons of *Ariſtotle*, the Animal which we ſpeak of ſeems not poſſible to be ingendred of a *Leopard* and a *Cat*, nor of a *Cat* and a *Panther*, which according to the moſt common Opinion is the Female *Leopard*; for neither the Stature of theſe Animals nor the times during which they go with Young are alike; the *Leopard* and *Panther* being Animals a great deal larger, and of a Species which carries its young much longer than *Cats*.

Our *Chat-pard* was but two foot and a half, from the end of its Noſe to the beginning of the Tail. It exceeded not one foot and a half in heighth, from the top of the Back to the end of the Fore-claws: The Tail was but eight inches.

There was nothing in all its exteriour Figure which is not in a *Cat*, ſave that its Tail was not long enough in Proportion to the reſt of the Body, whoſe Bulk did indeed ſurpaſs that of the largeſt *Cats*, but was alſo much inferiour to that of the *Leopard* and *Panther.* It had no long and ſlender Neck like thoſe Animals? It was on the contrary in ſome ſort ſhorter than the *Cats*; which we found to proceed in ſome meaſure from its extraordinary fatneſs.

But in this it ſeemed to us repugnant to the nature of the *Leopard*, which according to *Gallen* is the leaneſt of all Animals, unleſs it be ſuppoſed that our *Chat-pard* was ingendred of a *Leopard* and a *Cat*, and not of a *Cat* and a *Panther*; becauſe it is obſerved that commonly when there is a mixture of *Species*, that which is thereby ingendred has more reſemblance to the *Damme* than the *Sire*, eſpecially in that which reſpects the Form and Habit of the Body.

The groſneſs of the body of the *Hair*, was proportionably of the length as it is in *Cats*, but it was ſomewhat ſhorter. The *Colour* which moſt prevailed all over the Body was of a *Fox-red*; only the belly and inſide of the fore-legs was *Iſabella*, the Throat and bottom of the lower Jaw was white. There were black ſpots all over, long ones upon the Back, and round ones on the Belly and Feet, at the extremity of which the ſpots were very ſmall, and thickly ſeminated; on the Ears there were ſome very black ſtreaks which croſſed them; and in ſhort, they wholly reſembled thoſe of a *Cat*. The Hairs of the Beard were ſhorter than thoſe in *Cats* proportionably to the Body; and there was none on the Eye-brows and Cheeks, where *Cats* have them.

In opening the Belly there was found an extraordinary quantity of Fat, for all the intervals of the Muſcles of the lower *Venter* were filled therewith; and under the *Peritonæum* there was a piece which was bigger than ones Fiſt, which incloſed the *Vena Umbilicalis*. The two Skins or Coats of the *Epiploon*, which were likewiſe furniſhed therewith, did joyntly deſcend as uſually, and reached into the Groin; and folding themſelves under the Inteſtines, did embrace and keep themſelves ſuſpended as in a Sack.

The *Inteſtines* were almoſt all of an equal bigneſs, and had two thirds of an Inch diameter. The *Rectum* and *Colon* exceeded the other in bigneſs only one third of an Inch. Theſe two great Inteſtines together were twelve Inches long; the others from the *Pylorus* to the *Cæcum* about ſeven foot. The *Cæcum* was an Inch and a half in length, and two thirds of an Inch in its greateſt thickneſs. It terminated in an obtuſe point.

The *Stomach*, which was very great and large, had in the ſinuoſity, which is in moſt Brutes between the ſuperiour and inferiour Orifices, a Membrane greatly loaden with Fat, which joyned theſe two Orifices together, and which conducted the trunck of the *Vena Gaſtrica* to the bottom of the bending, without touching the Membranes of the Stomach; the *Vena Gaſtrica* being in this Membrane after the ſame manner as the Veſſels are in the *Meſentery*, and caſting its branches into the Stomach as the Veſſels of the *Meſentery* do caſt them into the Inteſtines, or as the *Vas breve* produces them to inſert them at the bottom of the Stomach, and in the Spleen.

The *Pancreas* was faſtened, and run along the *Duodenum* and *Ileum*, and advanced not far underneath the Stomach.

The *Spleen* was four Inches long, and fifteen lines in its greateſt breadth. It was of a dark-red colour, and its Figure very well repreſented that of an Oak leaf, being ſlit in ſeveral places.

The *Liver* was divided into ſix great *Lobes*, three whereof were indented in ſeveral places. Its *Subſtance* was ſoſt, and ſeemed to be compoſed of ſeveral *Glands*, as we have already remark'd in the *Liver* of the *Gazella*. This was found by two different Colours which were ſeen in this *Liver*; the bottom being black and ſpotted with a clear and yellowiſh red. But theſe ſpots had not a regular Figure like thoſe which have been obſerved in the Liver of the *Gazella*'s.

The *Gall-Bladder* was in the greateſt *Lobe* of thoſe which were again divided in two: its Colour inclined to Yellow. Its ſize was proportionable to that of the whole Animal, like as the *Kidneys*, whoſe proper Membrane was eaſily ſeparated, altho' the Veſſels which were numerouſly extended on the external Superficies of the *Parenchyma*, and which were very large and ſwelled, appeared through this Membrane, even as if it had been cloſely joyned to the *Parenchyma*: for theſe Veſſels were ſo viſible, that they ſeemed to appertain to this Membrane, altho indeed they were included in the ſubſtance of the Kidney; which has been already remark'd in the young *Lion*.

As for the Parts of Generation they were very defective and imperfect; for except the *Penis*, *Proſtatæ*, and *Caruncula* which is in the *Urethra*, there appeared not the leaſt ſign or remain thereof. There was only a Veſſel which might be taken for one of the *Deferentia*; but it was impoſſible to know certainly whether it was really one, becauſe that there was no appearance of *Teſticles*, and it could not be diſcovered from whence it came. As to the other *Spermatick* Veſſels, there could none be found, altho ſought after with all poſſible care: for it was doubted whether they were not broken through careleſneſs, as it is probable *Hofmannus* did, when he Diſſected a Woman in whom theſe two Spermatick Arteries were not found, although ſhe had had ſeveral Children. To clear this doubt, the *Vena Cava* was preſſed, and the Blood therein contained made to aſcend from the *Iliack* branches to the *Emulgent* Veins. The ſame compreſſion was likewiſe made on the left *Emulgent*, without getting out one drop of Blood, which was there very abundant, and free from coagulation. The great *Artery* was likewiſe tied a little below the *Emulgent*; and having blown into the Trunk there went not out any wind. 'Tis true, that having tied the Trunck above the diviſion of the *Iliack* Arteries, the wind loſt it ſelf through the Superiour *Meſenterick*, which was broken: but this branch being tied, the Air found no way out when blown, and when the whole Trunk was ſwelled up.

This defect of the *Spermatick* Veſſels and other parts which are abſolutely neceſſary for Generation, agreed very well with the abundance of Fat whereof this Animal was full, after the manner of all thoſe which by an external cauſe have been rendred incapable of Engendring, and in which the remainder of the nouriſhment could be imployed only to produce Fat.

This gave us ſome ſuſpition that our *Chat-pard* might have been Caſtrated when young, according to the Cuſtom which the *Turks* have followed, as much as they could, towards all the Males which they do keep in their Houſes, where they do frequently nouriſh theſe *Chat-pards*, eſpecially in *Barbary*, there being ſome appearance that the *Spermatick* Veſſels might have been conſumed and effaced by age, even as the *Anaſtomoſes* of the Heart are in Animals of a ſhort time after their Birth, when theſe parts wanting Action and Uſe, do wax dry and utterly Aboliſh. But the truth is, that we found not any Cicatrice in the Skin of the Belly; and conſidering that the *Umbilical* Veſſels do ſtill remain, altho contracted, when they do no more execute the Functions for which they were employed before the Birth; and that the *Spermatick* Veſſels ſerving for other uſes than Generation, have no reaſon to dry up for want of Imployment, when that, for which they were principally deſigned comes to ceaſe, ſeeing that it is ordinarily ſeen that as they paſs they ſhoot forth ſeveral branches for the nouriſhment of the adjoyning parts; we remain in our former Opinion, that this defect of ſuch important Organs muſt proceed from ſome other part, and that the Sterility which is common to ſome Animals which have been ingendred by the mixture of two different *Species* muſt have a particular cauſe in our Subject. For that which renders *Mules* Barren is not the defect of any of the Organs which are neceſſary to Generation, ſeeing that the difference which may be found in the Conformation of the *Matrix* of *Mares,* and that of *She-Aſſes* cannot, as ſome pretend, be the occaſion of Sterility; the *Mare,* in which ſomething is wanting that is found in the *She-Aſſe,* being not deprived of any of the parts which are abſolutely neceſſary to Generation, ſeeing that ſhe ingenders; and the difference of the Organs which is between the Species of Horſes, and that of Aſſes, hinder's not the Generation of *Mules,* which do proceed from the mixture of theſe two Species.

Therefore *Ariſtotle,* according to *Empedocles,* attributes this defect only to the Temper of theſe Animals, whoſe parts have contracted a hardneſs which renders them incapable of contributing to a new mixture; which this Philoſopher explains by the compariſon of *Copper* and *Tin,* which being ſeparately very Ductile and Malleable to be imployed in different and ſeveral works, are no more in a condition of being weilded and receiving a new form, by reaſon of a brittle hardneſs and ſharpneſs, which the Maſs compoſed of theſe two Metals acquires, when they are melted together.

So that if it be true that the *Lupi Cervarii* or *Ounces,* which are thought to be engendred of the *Wolf* and *Panther,* as *Maſtives* of the *Leopard* and *Bitch,* and the greateſt part of the other Animals which are born by the mixture of two Species, ceaſe not to be fertile; it muſt be thought that the Conformation of our *Chat-pard* was particular and accidental to it; and that the defect of the Parts which are wanting, and which made it incapable of Generation, proceeded not from this mixture of Species, which by changing the Conformation of the Parts could not corrupt it to the degree of rendring it uſeleſs to the Functions, and which is ſtill leſs capable of making a Mutilation; but which may more eaſily cauſe a vice in the Temper, which is a conſequence very natural from the mixture; and in fine, it is probable that if the *Mule* be the only Animal which the confuſion of Species makes Barren, it muſt needs be that there is ſomething particular in thoſe which have ingendred it, which is not found in the others. 'Tis that which *Ariſtotle* has obſerved in the *Horſe* and *Aſſe,* who hath both much leſs power for Generation, than all other Animals, ſeeing that in this *Genus,* which conſiſts of thoſe which are ſhort-liv'd, and which ought conſequently to be more readily engendred, the Females do carry their Conception a great deal longer, and have much more difficulty to give it its laſt perfection than others, by reaſon, as this Philoſopher ſays, of the hardneſs of their *Uterus*, which is like an Earth which Drought and Aridity have made ſterile.

For this being ſo, it is found that the *Mule* is Barren, not only by the general reaſon of the repugnance which is always found in the mixture of different *Species*, but likewiſe by the particular defect which was in both of the *Species* which are aſſembled for Generation, and which have not ſurmounted that repugnancy ſo powerfully as *Leopards*, *Dogs*, and *Foxes*, which are Animals fertile enough, to tranſmit to their Poſterity the powerful diſpoſitions which they have for Generation, notwithſtanding the contrariety which the mixture of different Species may cauſe.

The *Penis* was extraordinary ſmall, containing from the ſwelling of the *Iſchium*, which is its Origine, to the end, but an Inch and half, and but a Line and half in Diameter. There was found no Bone.

The *Diaphragme* was very fleſhy, and its nervous part very ſmall. The *Pericardium*, in which there was no water, was exceeding cloſe to the Heart; which happened perhaps by the ſwelling of this part, which after the manner of all things that do congeal, was puffed up: For this Diſſection was made the eleventh day of *January* 1670. at which time was felt a greater cold than ever was known. The *Ventricles* of the Heart were filled with great plenty of congealed and hardened blood, which was not in the Veins, perhaps by reaſon of its little quantity, which eaſily thaws in the parts which muſt neceſſarily be much handled in the Diſſection and Preparation thereof. The *Heart* was rounder and leſs pointed than in *Cats* and fierce Beaſts, by reaſon, as it is probable, that the extraordinary diſtention and enlarging of the *Ventricles* had made the point to ſhrink towards the Baſis.

The *Lungs* had eight *Lobes*, four on the right ſide, three on the left, and the eighth in the middle, in the cavity of the *Mediaſtinum* joyning the *Diaphragme*.

The *Os Frontis* had two very large *Sinus's*, which were ſquare and long, adjoyning to each other. There were two other *Sinus's* in the *Os Occipitis*: they were of a triangular form, and diſtant from each other, being of the right and left ſide of the *Cerebellum*. The Bone which ſeparated theſe two Brains had two points.

The *Brain* was divided in two by the *Falx* which was very large, and which did enter very deep therein. The *Anfractuoſities* were extended in length from the *Cerebellum* to the fore-part. At the place where the *Glandula Pinealis* uſually is, there was found only a little point about the bigneſs of a pins point, which was taken for this Gland.

The *Orbite* of the *Eye* was whole and bonie all round, the Bones of the *Temples* and that of the *Jaw* being joyned: but the internal and upper part was open, inſomuch that the *Ball* of the *Eye* touched the *Muſcles* of the *Temples*.

The *Ball* of the *Eye* contained eleven Lines in Diameter through the middle; the *Cornea* had nine. There was an Internal Eye-lid, which was ſeated in the great *Canthus* of the *Eye*, and which advanced towards the little one.

The *Aqueous* Humour, which was in exceeding great abundance, was not found congealed, although the *Vitreous* and *Cryſtalline* were hard Frozen: which demonſtrates that this Humour is improperly called *Aqueous*, and that its Subſtance is rather Spirituous and as it were *Ætherial*; becauſe that Congelation peculiarly belongs to Aqueous Liquors; thoſe which are Fat and Oleaginous being capable only of Coagulation, even as thoſe which are Spirituous and Ætherial do ſuffer neither Congelation nor Coagulation: So that it is probable that this Subſtance, which is lock'd up in the forepart of the Eye, has nothing of Water but the Tranſparency and Fluidity, becauſe that it has need of an extraordinary thinneſs and Subtilty, to ſerve for the Refraction which muſt be made in the *Cryſtalline*, whoſe ſubſtance is thicker, by eſtabliſhing the diverſity of the Medium, which is neceſſary to this Operation.

The *Choroides* was brown, and the *Retina* white. The *Tapetum* was alſo of a blewiſh white. In the place of the Optick Nerve there was obſerved a black point. The Nerve entered into the Eye almoſt directly over the middle of the *Tapetum*. The *Cryſtalline* contained five Lines Diameter, and its Poſteriour part was not ſo Convex as the Anteriour.

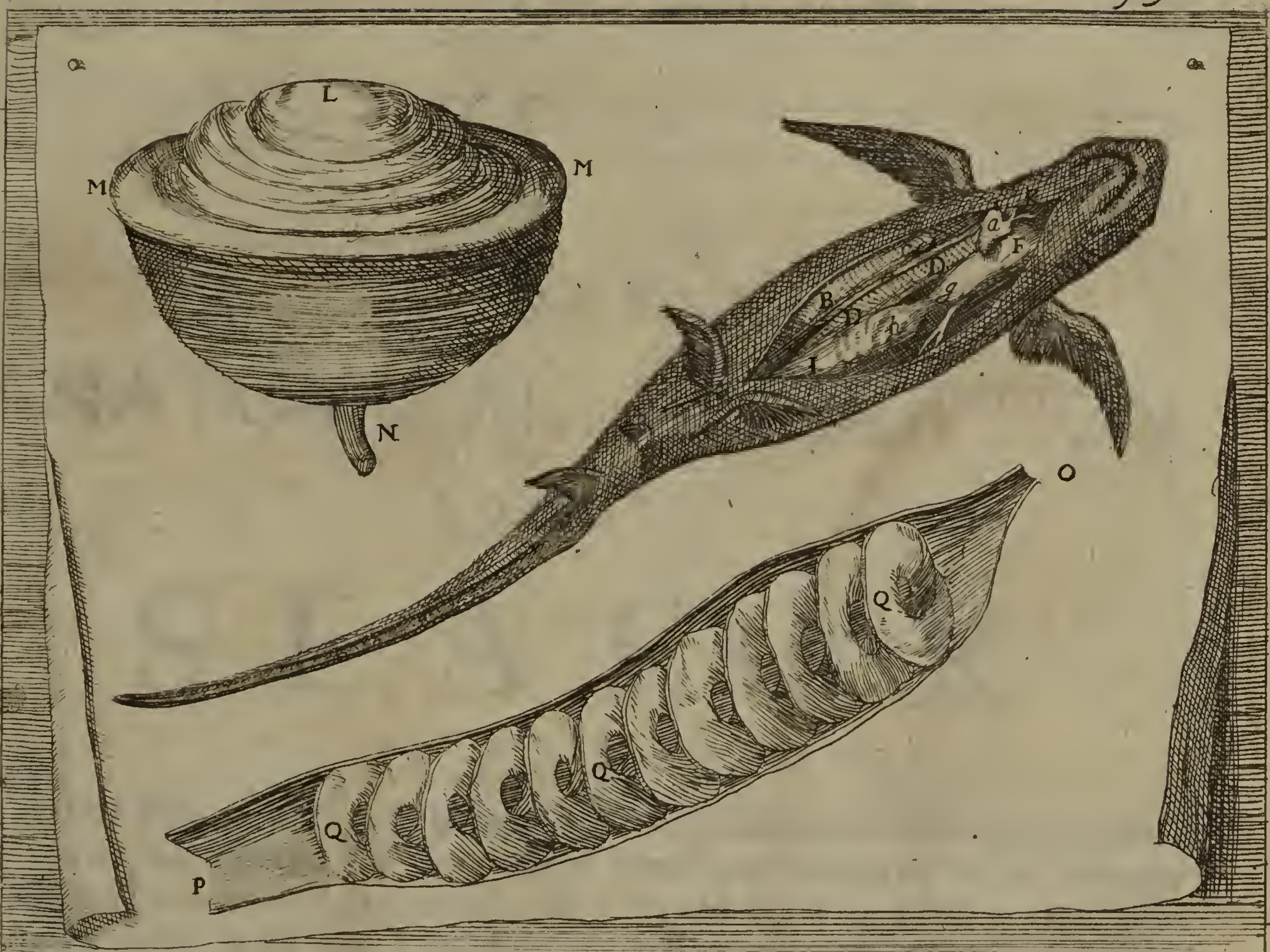
The

The Explication of the Figure of the Sea-Fox.

IN the lower Figure it is laid in ſuch a manner, that there may be ſeen the two Fins which it has on its Back, Eye, Noſtril, and the five Apertures of the Gills, with the Teeth which are on the right ſide all of one ſingle Bone, making only one row, and after another manner than on the left ſide, where they are ſeparated from each other, and diſpoſed in ſeveral rows, as is ſeen in the upper Figure.

In the Upper Figure.

a. *Is the* Heart.
B c. *The Right* Lobe *of the* Liver.
c. *The* Gall-Bladder, *of which but a ſmall part is ſeen, it being incloſed in the* Liver.
D D. *The Left* Lobe *of the* Liver.
e. *The* Spleen.
F g. *The* Ventricle.
g h. *The* Duodenum.
h I. *The great* Inteſtine.
j. *The* Auricle *of the* Heart.
K. *The* Aorta Aſcendens.
L. *The* Cornea *ſunk and folding over the* Cryſtalline.
M M. *The Edge of the* Sclerotica.
N. *The* Optick Nerve.
O P Q. *The great* Inteſtine, *part of whoſe coat is taken away to ſhew the* Spiral *Membrane that is within it.*
O. *The part next the* Duodenum.
P. *The beginning of the* Rectum.
Q Q Q. *The* Srcew-like *or* Spiral *Membrane.*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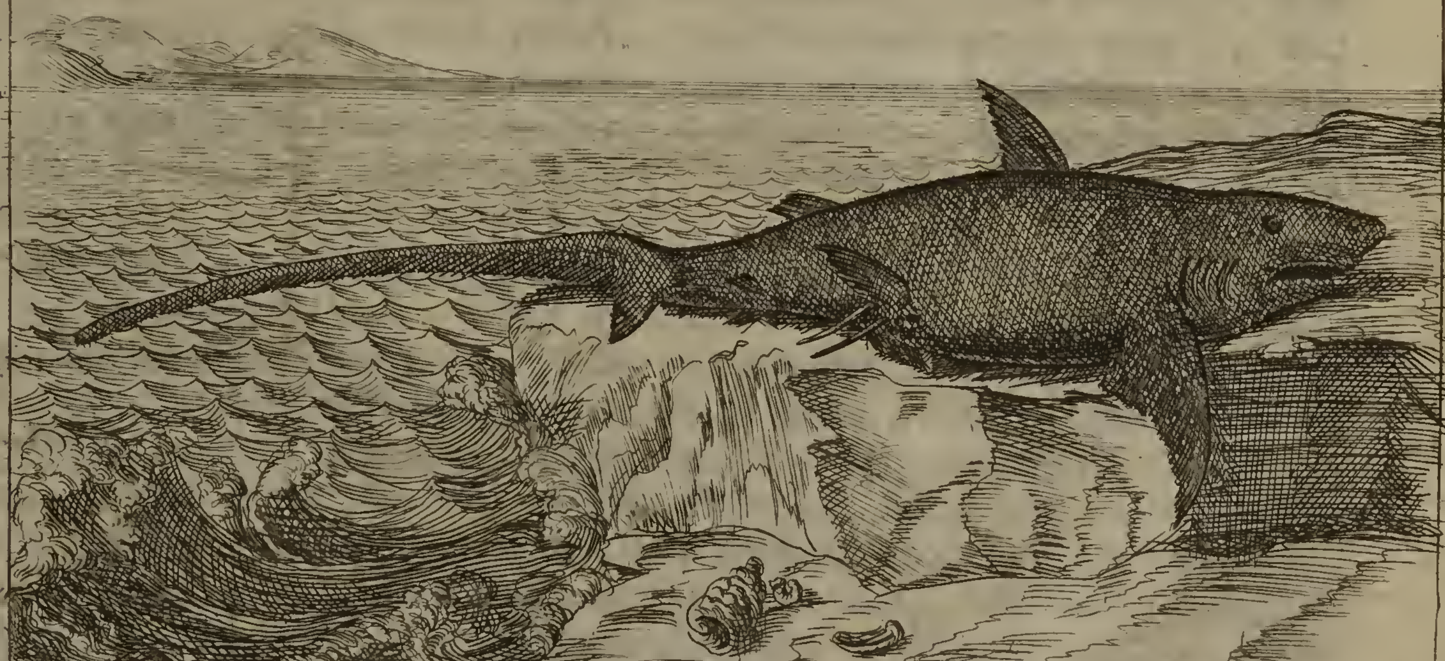

THE ANATOMICAL DESCRIPTION OF A SEA-FOX.

IN this Fiſh we found all the marks by which Authors deſcribe that which they do call the *Sea-Fox,* except ſome particularities which are pretended to have made it ſo named. For they do ſay that it has a great deal of reſemblance with the *Land-Fox*, as well in its Tail, as in its Subtilty, Smell, and Taſt of its Fleſh: but none of the Company obſerved that it ſmell't otherwiſe than the Generality of Sea-fiſh. Its Fleſh was found well taſted, to make it to be taken, (as it has been by ſome Authors,) for the *Accipenſer*, or at leaſt to make it unlike that of the *Fox*, which is known to be very ill; and it cannot be believed that this Animal can have a great deal of Subtilty, if it be true that the Brain contributes to it, for there was hardly any found in it. As for the Tail it is indeed very ſtrange, but it nothing reſembles that of a *Fox*.

The *Sea-Fox* is by Authors put in the unflat Cartilaginous Cetaceous Kind, which are called *Galeodi*. Their generical differences, are to have two Livers, five *Bronchiæ* or Gills of each ſide, and pendent points at the Finns which are under the Belly, at the ſides of the Navel in the Males. Theſe Fiſhes are of ſix *Species* called *Canicula*, *Acantias*, *Muſtelus*, *Galexias*, *Aſterias*, and *Alopecias*, which is our *Sea-Fox*, whoſe Specifick difference, as to the Figure, is taken from its Tail, which very perfectly repreſents a Sythe.

The length of this whole *Fiſh* was eight foot and a half, and its greateſt breadth directly over the Belly fourteen Inches. Its Figure was ſuch, that from the end of the Noſe to about the middle of its whole length, it had the common form of a Fiſh: for it grew larger toward the Belly, and then it did contract, to the place where the Tail of other Fiſhes end. But there it is that his began, which was almoſt as long as all the reſt of the Body, and made like a *Sythe* bent towards the belly. At the place where this Sythe began, there was a ſingle Fin underneath, which *Salvian* reports to be at the top, where there was only an Eminence, which was an Articulation that made the *Spine* to bend in this place higher and lower more eaſily than in all the reſt of the Body, where the Flexion was eaſie only to the right and left.

There were two *Fins* elevated on the Back, a great one in the middle, and another leſs towards the Tail, altho *Ariſtotle*, according to the report of *Athenæus*, ſays that it has not any Fin on the Back. It had three Fins on each ſide. The two next the Head were large, and repreſenting the wings of a Bird, which is the reaſon perhaps that induced *Ariſtotle* to ſay that there is a *Fox*, which like *Batts*,hath leather wings. Theſe Fins were fifteen Inches long, and five broad at their Baſis. Thoſe which were at the middle of the Belly were of a middle ſize. They were at the ſide of the Navel, and had each a pendent point: which is proper to the Males in this ſort of Fiſh, as it has been ſaid. The laſt near the Tail were very ſmall.

The *Skin* was ſleek and without Scales; the Creſts and Fins were hard, and compoſed of ſmall *Spines* reſtrained by the Skin which covered them, the Colour of which was all over alike of a very dark-gray, blewiſh like Mud, and not white at the Belly, as in *Salvian*'s Fox.

The Opening of the *Mouth* was five Inches, and armed with two ſorts of *Teeth*. The right ſide of the upper *Jaw*, to the place where are the *Canini* of other Animals, had a row of ſharp *Teeth*, hard and firm, being all of one ſingle bone in the form of a Saw; but this bone was much harder than the other bones which are faſtened with a Cartilage in theſe ſorts of Fiſhes. The other Teeth,which were on the ſide of this and all the lower Jaw, made ſix rows throughout, and were moveable and faſtned by fleſhy Membranes. Their *Figure* was Triangular ſomewhat ſharp, and their *Subſtance* much ſofter than that of the others which are like a Saw, eſpecially in the inward rows, where they were very brittle and ſofter than the Cartilage, ſo that there were ſome which appeared only like an hardned Membrane.

The *Tongue* was all firmly fixed to the lower Jaw, and compoſed of ſeveral Bones ſtrongly articulated to each other by a fibrous Fleſh. It was furniſhed with a hard *Skin*, and covered with little ſhining points, which made it very rough from the inſide outwards, and very ſleek and ſmooth from the outſide inwards. Theſe points viewed with a Microſcope were tranſparent as Cryſtal, and appeared to have three Lines in length, and one and a half at their Baſis.

The *Throat* was very large, and the *Oeſophagus* was not leſſer than the *Stomach*, in which Authors do ſay that this Fiſh conceals its young when they are afraid,by ſwallowing them down to vomit them up again; and this is the reaſon which made *Ælian* and *Plutarch* to ſay, that the Subtilty which this Fiſh has to quit it ſelf of the Hook which it has ſwallowed, is to ſpew it up with its Stomach,which as *Ælian* reports,it can turn the wrong ſide outward: which is much more probable than what others do ſay, *viz.* that it proceeds to ſwallow the Line untill it has found a place weak enough to cut it with its Teeth; becauſe it has no *Inciſores*.

This *Stomach* was about fifteen Inches long, and five broad, terminating at the bottom in a very ſtrait *Pylorus*, which was like a choaking, making the paſſage of the *Stomach* to the *Inteſtine*. This *Ductus* or paſſage, which exceeded not three Lines in length, and one and a half in Diameter, was very ſmooth and ſlippery, even as the *Oeſophagus,* but the inſide of the *Stomach* was rugged, and like to that of Animals which chew the Cud, which is called *Reticulum.* In the *Stomach* there was found a branch of the Sea-plant called in French *Varec,* about five inches long, and a Fiſh of the ſame length without a Head, Scales, Skin, and Entrails, being all digeſted, except the Muſculous Fleſh, which was left entire.

After the *Pylorus* the *Inteſtine* was a little enlarged even to contain four Lines Diameter, for the length of five Inches, which may be taken for the *Duodenum,* which was afterwards dilated for the forming a great Inteſtine, which was about eighteen inches long, and three broad. Its inferiour part, which was ſmooth, and ſeven inches long, was the *Rectum.* The Superiour which contained about thirteen Inches, had a very particular ſtructure; for inſtead of the ordinary Circumvolutions of the Inteſtines, the Cavity of this was tranſverſly interrupted with ſeveral ſeparations compoſed of the Membranes of the Inteſtine folded inwards. Theſe ſeparations were near half an Inch diſtant from each other, and turned round like the ſhell of a Snail, or of a Stair-caſe with an open Newel: which is the reaſon, as it is eaſie to conjecture, why the nouriſhment ſtays, and is a great while in paſſing, altho the way be very ſhort.

The *Liver* took up the whole length of the right-ſide of the Belly. It was divided into two *Lobes*; which has made Authors to ſay that this *Fiſh* hath two Livers. The longeſt of theſe Lobes was twenty Inches, the other eighteen, each containing only five in breadth: its colour was reddiſh, and was ſtreaked all along, and acroſs by obſcure Lines. The *Gall* was incloſed at the top of the great Lobe in the ſubſtance of the *Parenchyma,* and was not gathered into a *Veſicle*; but its colour only ſeemed to appear green through the Tunicle of the Liver. The two *Lobes* weighed five pounds and a half. The *Veſicle* had in the inſide as it were leaves compoſed of its Tunicle: The *Gall* which it contained was found to have more of Acidity than Bitterneſs.

The *Spleen* was faſtened to the bottom of the Stomach. It was double like the Liver, and terminating in two unequal points, the longeſt of which was five inches. Its Colour reſembled that of the Liver, being only ſomewhat leſs dark, and leſs brown. Near the *Spleen* there was obſerved a *part* faſtened to the *Inteſtine,* which might be ſaid to be the *Pancreas,* becauſe that it was as it were Glandulous, but blacker then the *Spleen.*

Towards the *Navel* there was found a part ſhut up in the inſide, about two inches long, and pointed at the end, which was judged to be the part which made the Sex, which was already diſcovered by the two points already mentioned, and which Authors report to be found only in the Males.

The *Bronchiæ* or *Gills,* which are five of each ſide, had this common amongſt them that their Aperture, which is about two inches and a half, was inlarged almoſt as much again in the inſide, to lap over a hole like to their Aperture: That wherein they differed, is that the three middle holes were greater, and provided on the inſide with *Bronchiæ.* The two laſt which are ſomewhat leſſer, eſpecially that which is moſt diſtant from the Head, had this particular, that they were ſmooth, and without thoſe Foliages whereof the *Bronchiæ* or *Gills* are compoſed.

The *Heart* had no *Pericardium*; but there was a Membrane like to that of the *Pericardium* which reinveſted and inveloped the *Aorta*. The bigneſs of the *Heart* and its *Figure* reſembled a *Pullets* Egg. Its *Ventricle* which was ſingle as in moſt Animals which do not breath, had five *valves*, three *Sigmoides* at the mouth of the *Aorta*, and two *Tricuſpides* at that of the *Vena Cava*. The *Heart* had likewiſe one ſingle *Auricle* very large, and the beginning of the *Aorta* was girt with a fleſhy ring of ten Lines. The *Aorta Aſcendens* having caſt forth ſome branches for the Brain, was conſumed, and near all loſt under the Tongue.

The *Head* was a meer lump of Fleſh, being covered with the Muſcles of the Temples, which contained four Inches in thickneſs. The *Cranium* was not bigger than ones fiſt; it was near two fingers thick at top. This thickneſs was excavated by cavernous and unequal *Sinus's*. They were almoſt all empty, containing only a little mucous matter mixt with Blood. The *Brain* which was very ſmall, and had but little Anfractuoſity, was ſo ſoft and flabby, that no Obſervation could be made on its Structure.

The *Spinalis Medulla*, which ſhot out all along through the *Foramina* or holes which are between the *Vertebræ*, Filaments of *Nerves* about the bigneſs of a pin, produced at the beginning of its Exit out of the *Cranium*, three Pair which were about a line and a half in bigneſs, two whereof divided themſelves at the Temporal Muſcles, and at thoſe which do move the great fore-Fins; the third Pair run all along the *Back-bone*, always keeping the ſame bigneſs, although it continually caſt into the Fleſh little branches like thoſe which proceed from the *Medulla Spinalis*.

The *Eyes* which were larger than thoſe of an Ox were only demi-ſpherical, being flat before, and the *Sclerotica* making as it were a Cup. This *Membrane* was very thin, but ſo hard that it might rather paſs for a *Bone* than a Membrane. On the contrary, the *Cornea* was ſo tender, that it was folded and ſunk on the *Cryſtallinus*, which was perfectly Spherical, as it is generally found in Fiſhes; yet in one of the Eyes it was ſomewhat flatned.

The Anteriour *Uvea* was not black, nor very obſcure in the inſide, but only greyiſh, as it is on the outſide, where it makes the *Iris*. The *Choroides* was of the ſame colour, and its ground had that luſtre of Mother of Pearl which is in *Terreſtrial* Animals, and which we do call the *Tapetum*, but with colours leſs briſk. The *Retina* was adorned with Sanguinary Veſſels very apparent.

This *Fiſh* was very Fleſhy, and in ſeveral places we found *Fat* above an inch thick; which very much Fortifies the Opinion of *Archeſtratus*, who in *Athenæus* averrs that the *Sea-Fox* is that Fiſh which thoſe of *Syracuſe* do call *Cyna Piona*, by reaſon of the abundance of Fat which it hath? which is contrary to the Opinion of *Epænetus*, who ſays in the ſame Author, that Cartilaginous Fiſhes have none.

The Explication of the Figure of the Lupus Cervarius *or* Lynx.

THAT which is moſt Conſiderable in the lower Figure is the black Hair, which makes the Tuft that each Ear has at the tip, and the roundneſs of the Head as well as the reſt of the ſhape of the Animal which nothing participates of that of the *Wolfe.*

In the Upper Figure.

A. *Is one of the* Kidneys *as big as the Life.*
B C. *The* Tongue.
D D. *The* Integuments *of the lower Belly.*
E E. *The* Liver.
F. *The* Gall-Bladder.
G. *The* Ventricle.
H. *The* Spleen.
I. I. I. *The Veſſels making that, called the* Vas-breve.
K. K. K. *The* Epiploon.
L. L. L. *The* Inteſtines.

THE

THE ANATOMICAL DESCRIPTION OF A LUPUS CERVARIUS OR LYNX

SOme Authors have thought that this Animal was called *Lupus Cervarius*, from its Figure and Colour, ſuppoſing that it has the ſhape of a *Wolfe*, even as it in ſome meaſure reſembles the *Stagg* in the Colour of its Hair. This very Reaſon hath made others to think that it is the *Thos* of the Ancients, becauſe *Oppian* reports that the *Thos* has the Form of its *Sire* which is the *Wolfe*, and Colour of its *Damme* which is the *Leopardeſs*. But the truth is that the *Lupus Cervarius* or *Lynx* has nothing which reſembles the *Wolfe*; and the little reſemblance which it takes from the *Leopard* or *Stagg* is ſo common to a great many other Animals, that it is more probable, as ſeveral Believe, that the Name of *Lupus Cervarius* is given unto it, becauſe that it hunts *Staggs*, as the *Wolfe* devours *Sheep*.

That which was Diſſected had not the Noſe long and pointed like the *Wolfe*, but blunt and ſhort, which made it rather to reſemble a *Cat*. The length of the whole Head was ſeven Inches, that of the Neck four: The reſt of the Body contained twenty four Inches, without comprehending the Tail which had but eight; the whole amounting to three Foot ſeven Inches. The height from the extremitie of the Back to the end of the fore-paws were twenty Inches, and there were twenty three from the *Os Sacrum* to the extremities of the hind-Feet.

The fore-Paws had five Toes; the hind-ones only four. All theſe Toes were armed with Claws crooked, pointed, and articulated as in the *Lions*, *Bears*, *Tigers* and *Catts* which we have Diſſected.

The Back was of a *Fox-red*, marked with Black Spots. The Belly and inſide of the Leggs was of an Aſh-colour, ſpeckled alſo with Black Spots, but differently; for the Spots of the Belly were larger, not ſo Black, nor ſo cloſe to each other as thoſe of the Back, Leggs and Paws, whoſe outſide was red like the Back. The greateſt part of the Hair, *viz.* that which appeared red, and that which appeared of an Aſh-colour, was indeed of three Colours, having the root of a Dark-Gray, and the extremity White: But this Whiteneſs of the extremity took up ſo little a portion of the Hair, that it prevented not the ſeeing its principal Colour, which was that of the middle, and it made the whole Superficies of the Body to appear only as if it were powdered. The Hair, which made the Black Spots, was but of two Colours, hauing no White at the end, and being only leſs Black towards the root, which nevertheleſs was Browner than that of the other Hair.

The *Dentes Canini*, which were four, were eight Lines long in the upper-Jaw; the two of the lower-Jaw but ſix. Between the *Canini* there were in each Jaw ſix *Inciſores*, and thoſe of the upper were likewiſe longer than thoſe of the lower. There were ten *Molares*, five in each ſide, *viz.* two above, and three below in each Jaw.

The *Tongue* was four Inches and a half long, and an Inch and a half broad. It was covered with Pricks as in the *Lion* and *Catt*. Theſe Points from the tip of the Tongue to the middle were very hard and ſharp, and were turned towards the root of the Tongue. Thoſe which were from the root to the middle were turned contrary; and were blunter and ſofter.

The *Ears*, which greatly reſembled thoſe of a *Catt*, had each on the tip which was pointed, a *Tuft* of very Black Hair, which ſeemed to us to be a Character very particular to the *Lupus Cervarius*, to diſtinguiſh it from ſeveral other Animals which are deſcribed in the Hiſtories of the Antients, as the *Thos*, *Chaos*, and *Panther*, which modern Authors have taken for the *Lupus Cervarius*; but in none of which has there been obſerved this *Tuft*, which *Ælian* reports to be at the end of the Ears of the *Lynx*, after the ſame manner as we found it in our Subject, and in other *Lupi Cervarii* which are in the *Park* of *Vincennes*.

It is very hard to conjecture why modern Authors have taken the *Lupus Cervarius* for the *Thos* of the Ancients, of which ſome, as *Theocritus*, have only reported it to be a kind of *Wolfe*; and others, as *Homer*, that it Eats *Staggs*: For it is pretended that this Author has in ſome meaſure deſcribed the Nature of the *Thos*, by compareing them to a multitude of *Trojans*, which preſſing *Ulyſſes* in a Combate are put to Flight by *Ajax*, who comes to reſcue them: But by this Compariſon he gives us to underſtand that the *Thos* are weak, and Cowardly Animals, ſeing that being aſſembled to eat a *Stagg* which has been wounded by a Hunts-man, they do leave it to a *Lion* which unexpectedly comes upon them. For this reaſon they are by the *Scholiaſt* interpreted *Pantheria*, which are a kind of weak and timerous *Wolfe*. *Ariſtotle* and *Theocritus* do likewiſe ſay, that the *Thos* reſembles the *Wolfe*, that he is ſwift-footed, and leaps a great way, although he has ſhort Leggs.

But there are other reaſons to make us beleive that the *Lupus Cervarius* is not the *Thos*, which are much more powerful. For beſides our not finding our *Lupus Cervarius* to have ſhort Leggs, the other Marks alſo which the Antients do attribute to the *Thos* are wanting in it, having not the Figure of the *Wolfe*, as *Ariſtotle* and *Oppian* deſcribe it, not being weak and timerous, as *Homer* repreſents it, not having another Colour in the Winter than in the Summer, nor being of the kind of Animals which do love Man, which do him no harm; and which do not avoid him: For it is known that theſe Characters, by which *Ariſtotle* and *Pliny* do repreſent the *Thos*, are not found in the *Lupus Cervarius*; and the greateſt part are contrary to what we have obſerved in that which we Diſſected.

There was only the changeing of the Hair which we at firſt thought to be ſo as *Ariſtotle* repreſents it in the *Thos*; becauſe that the Hair of the *Lupus Cervarius*, which was brought to us towards the end of Autumne, was very different from the Hair of thoſe we had ſeen in the Summer in the *Park* of *Vincennes*; theſe laſt having not their Backs Red, nor ſpotted with Black like ours, but only confuſedly intermixt with Black, Gray, and Red: Beſides that their Hair was ſhort, thick, and courſe as in a *Maſtive*, whereas our *Lupus Cervarius* had it long, ſoft, and fine like that of a *Catt*. But we at laſt found that this diverſity in the Colour of Hair proceeded not from the alteration which happens to it according to the Seaſons, but from the difference of the *Species* of the *Lupi Cervarii*: For there are ſome whoſe Back is Red, ſpotted with Black, which do come from *Muſcovia*, ſuch as was ours; and others which do come from the *Levant* and *Canada*, which have no Spots on the Back, ſuch as are thoſe which we have ſeen at *Vincennes*.

Therefore Authors do differ amongſt themſelves, and there are ſome which do even contradict themſelves on this Opinion that the *Thos* is the *Lupus Cervarius*. For though *Scaliger* and *Gaza* do always interpret the *Thos* in *Ariſtotle*, *Lupus Cervarius*, which *Geſner* and *Gillius* do likewiſe in *Ælian*; yet *Scaliger* when he ſpeaks of the *Lupus Cervarius*, ſay's that he thinks it is the Male *Lynx*, which may make us to think that he takes the *Thos*, *Lynx*, and *Lupus Cervarius* for the ſame Animal, conformable to the Explication of *Petrus Crinitus*, who interprets *Thoes* in *Homer* Lynces, and to that of *Euſtathius*, who ſays that the *Thos* is no weak and timerous Animal, becauſe that he judges the *Thos* to be the *Lupus Cervarius*, which indeed is ſtrong and couragious.

But *Hermolaus* on *Pliny*, ſays that he cannot ſufficiently wonder at the errour of thoſe who do take the *Lupus Cervarius* for the *Thos*: For the Species of the *Wolfe*, which is pretended to be the *Thos*, is a weak and timid Animal, which is by *Geſner*, *Gaza*, and *Niphus* called *Lupus Canarius*, *Lupus Armenius*, and by the *Scholiaſt* of *Homer* *Panther*; and *Oppian* puts the *Thos* among the little and inconſiderable Beaſts, ſuch as are *Dormice*, *Sqvirrels*, and *Catts*; which is confirmed by *Heſychius*, and ſeems to be very ſuitable to the Idea which *Homer* gives of the *Thos*.

So that it remains only to ſee whether our *Lupus Cervarius*, which has ſo little relation with the deſcriptions which the Antients do make of the *Thos* and *Panther*, has any more with what they have Writt of the *Chaos* and *Lynx*. *Hermolaus* makes no queſtion that it is the *Chaos* of *Pliny*. And indeed, when this Author ſpeaks of the *Lupus Cervarius*, he reports the ſame thing thereof as he ſaid of the *Chaos*, which is that *Pompey* ſhewed ſome in his *Theater* at *Rome*, which were ſpotted like the *Leopard*, and which had been ſent from the *Gaules*, that is to ſay, a *Northern* Country, where the *Lupi Cervarii*, which have Hair like that of the *Leopard* are found in great plenty.

But the difficulty lies in what *Pliny* ſays that they had the Shape of the *Wolfe*; which we found not, as has been ſaid, in our *Lupus Cervarius*. Inſomuch that there remains only the *Lynx*, of which the Ancients do ſay nothing which is repugnant to what we have ſeen in our *Lupus Cervarius*, in which we have likewiſe found all that they report of the *Lynx*.

For beſides the lock of Black Hair which *Ælian* Remarks on the tip of the Ears of the *Lynx*, and which we have obſerved to be after the ſame manner in our Subject, which is a very particular Mark, we have likewiſe found that it has a ſhort Noſe like *Ælian*'s *Lynx*, and it is known that the *Lupus Cervarius* is very cruelly bent after the hunting of *Staggs*, which *Oppian* Reports to be peculiar to the great *Lynx*; of which he makes a Species different from the little one which Hunts *Hares*. For as to the Blackiſh Colour which *Pliny* gives to the Hair of the *Æthiopian* Lynx, he mentions it as a thing extraordinary. And in ſhort as for what concerns its ſight, which *Pliny* Reports to be more piercing than in any other Animals, we have Remarkt nothing which may obſtruct, or hinder us from believeing our *Lupus Cervarius* to have had a very pierceing Sight; beſides it is not very certain whether that which is reported of the ſight of the *Lynx* muſt be underſtood of that of a wild Beaſt, or of a Man of that Name, who had a Sight ſo good, as *Pliny* affirm's, that he ſaw the Moon when it changed; or of an other, who, as *Georgius Agricola* explains it, had the repute of ſeeing thro' the Earth, becauſe that he knew how to diſcover where the moſt concealed Metals were.

As for what concerns the Inwards of our *Lupus Cervarius*, which was a Female, we found that it had a Stomach like to that of *Cats*, having nothing extraordinary either in its Structure or Bigneſs, which was proportionable to that of the reſt of the Body.

The *Spleen* which was laid along the left part of the Stomach was of a Rediſh Colour. Its Length was ſeven Inches, and its Breadth but one. All along one of its ſides, *viz.* that which was towards the Stomach, it had an Eminence which made an Angle.

The *Epiploon*, which covered and incloſed the Inteſtines, was like a Network of Cords of hard and ſolid Fat, whoſe void ſpaces were filled with Membranes pierced with an infinite number of little holes, ſo that as theſe Membranes were not capable of retaining Water like thoſe of the *Epiploon* of Men and ſeveral other Animals. Theſe Ropes of Fat did incloſe and cover almoſt all the Veſſels of the *Epiploon*.

The *Inteſtines*, which were of an equal bigneſs, contained altogether nine Foot and a half in length: which ſeem's to have been obſerved by *Pliny*, who ſpeaking of Animals which have ſhort *Inteſtines*, produces only two examples, which are the *Lupus Cervarius* and *Ducker*. Yet we have already Remarkt in the *Lyons* that we Diſſected, that their *Inteſtines* were not above three times longer than the whole Body, which is the proportion of the *Inteſtines* of the *Lupus Cervarius*. There was a *Cæcum*, but it had no *Appendix*.

The *Liver* had ſeven Lobes, which were long and ſtraight. The longeſt was five Inches, and the broadeſt two and a half towards the Baſis. The *Gall-bladder* contained nine Inches in length, and not exceeding half a one in breadth.

The *Pancreas Aſellianum* was three Inches long, and fifteen Lines in its greateſt breadth. It had a Cavitie full of ſlimie and putrified Seroſitie, which was the occaſion of an Abceſs in the Center of the *Meſentery*.

The *Kidneys* were ſituated at an equal heighth oppoſite each to other. They were two Inches in length, and one in breadth.

The *Matrix* reſembled that of *Bitches* and *Cats*. It contained four Inches and a half from the external *Orifice* to the Bifurcation of the two Hornes or Ductus's, which from the Bifurcation to their Extremitie where the *Teſticles* were, contained each four Inches and a half in length. The *Teſticles* were ſix lines long, and four broad: They were compoſed of ſeveral *Glands*.

The *Lungs* had ſeven *Lobes* like the Liver. They were almoſt all dryed up and friable through the extraordinary heat of the Blood, which was Blackt by aduſtion. This Blackneſs of the Blood had made the Heart livid, and tinged the Water of the *Pericardium*, ſo that it was Bloodie. The *Heart* was two Inches and a half long, and two Inches broad. The *Auricles*, *Veſſels* and *Valves* were as in a *Catt*.

The *Muſcles* of the *Temples* were large and ſtrong, being eight Lines in thickneſs, and two Inches in breadth. This bigneſs ſeemed to us very conſiderable, to make dubious the beliefe which we had that the *Lupus Cervarius* is the *Lynx* of the Antients; becauſe that when *Galen* ſpeaks of the different ſize of the *Muſcles* of the *Temples* in various Animals, he gives only three examples of thoſe which have them extraordinary ſmall and feeble, which are *Man*, the *Ape*, and *Lynx*. But it is probable that *Galen* means the little *Lynx* of *Oppian*, which only hunts *Hares*, and not that which devours *Staggs*, which is the *Lupus Cervarius*.

The *Sinus*'s of the *Skull* were very ample and open. The Bone which ſepertes the Brain from the *Cerebellum* was like to that which we have found in a *Tiger*, *Fox*, *Dog*, *Cat*, and a great many other Animals.

At the opening of the *Skull* the *Anfractuoſities* of the *Brain* appeared thro' the *Dura Mater*, which was tranſparent. The external part and Subſtance of the Brain, which is called the *Cortex*, was very white and ſolid. The *Glandula Pinealis* was very ſmall.

The *Ball* of the *Eye* was an Inch Diameter: It was almoſt Spherical, except the *Cornea*, which was raiſed ſomewhat more pointing.

The thickneſs of the *Cornea*, which was half a Line, was every where alike. It was joyned as uſually with the *Sclerotica* by the mutual Attenuation of the extremitie of the two Membranes, which being each in this place made like the *Diamond-cut* of a *Glaſs*, do ſo joyn themſelves that both together are not thicker than each apart, becauſe that the thinneſt place of the one, which is its extremitie, lyes upon the thickeſt place of the other.

Theſe Sloapeings were each two thirds of a Line broad. The *Sclerotica*, which was outwardly White, and inwardly ſomewhat Blackiſh by the touching of the *Uvea*, was very thin at the bottom, not being thicker than ſtrong Paper. It was twice as thick at its extremitie towards the *Cornea*.

At the ſide of the *Cornea* there was a Membrane as in the *Lyon*, which ſerves for an internal Eye-lid which eaſily covered all the *Pupilla* when it was thruſt over it. It was of a triangular Form. The two leſſer ſides were faſtened to the *Conjunctiva*. The third, which was the largeſt, could ſlip and advance over the Eye to cover it.

The fore-part of the *Iris* was of a Yellow-colour mixt with a great many little red Lines, which were broken and of an unequal ſize. It was Black at the hinder part which lay upon the *Cryſtalline*.

The *Aqueous* Humour was very abundant, but ſomewhat muddie, being ſullied by the diſſolution of ſome part of the Black Subſtance which is faſtened to the *Uvea*.

The *Cryſtaline* was ſeven Lines diameter, and five thick, three of which made the *Anteriour Convexitie*, and two the *Poſteriour*.

The *Vitreous* Humour was very Clear and Tranſparent.

The *Tapetum* of the *Uvea*, which was of a Blewiſh White, was pierced by the *Optick* Nerve, not at its extremitie, as it is ſeen in moſt Animals, but almoſt in its Center. The *Optick* Nerve had in its middle a Red point inclineing to Black.

The Explication of the Figure of the Caſtor or Beaver

IT is repreſented below, with half of the Body, that is the fore part, on the Land, and hind part in the Water; becauſe that it was obſerved dureing the time that it was kept, that it loved frequently to plung its hind-Paws and Tail into the Water.

In the Upper Figure.

A A. *The* Os Pubis.
B. *The bottom of the* Bladder.
C C. *The two firſt Pouches, which are the largeſt of thoſe, wherein the* Caſtoreum *is prepared and contained.*
D D. *The two ſecond, which are leſs.*
E E. *The other* Pouches *of a third ſort, incloſed in the ſecond.*
D E. *Several little globular Body's ſeen upon the ſecond and third ſort of* Pouches.
F. *The Common Hole to the* Inteſtine *and* Penis.
G. *The begining of the* Penis.
H H. *The* Epididymides.
I. *The* Teſticles.
K K. *The* Vaſa Spermatica Præparantia.
L L. *The* Deferentia.
M M. *The* Cremaſter's.
N. *One of the fore-Paws.*
O O. *The* Colon.
P. *The* Cæcum.
Q. *A Ligament faſten'd to the* Cæcum, *along which are ſpread ſeveral Veſſels which looſe themſelves in the Coat of this Inteſtine.*
R R. *The Brain.*
S. *The* Sinus *of the* Dura Mater.
T T T T. *Four other* Sinus's *proceeding from the other, which divide the* Cerebellum *in three.*
V V V. *The* Cerebellum.
X. *The bone of the* Penis.

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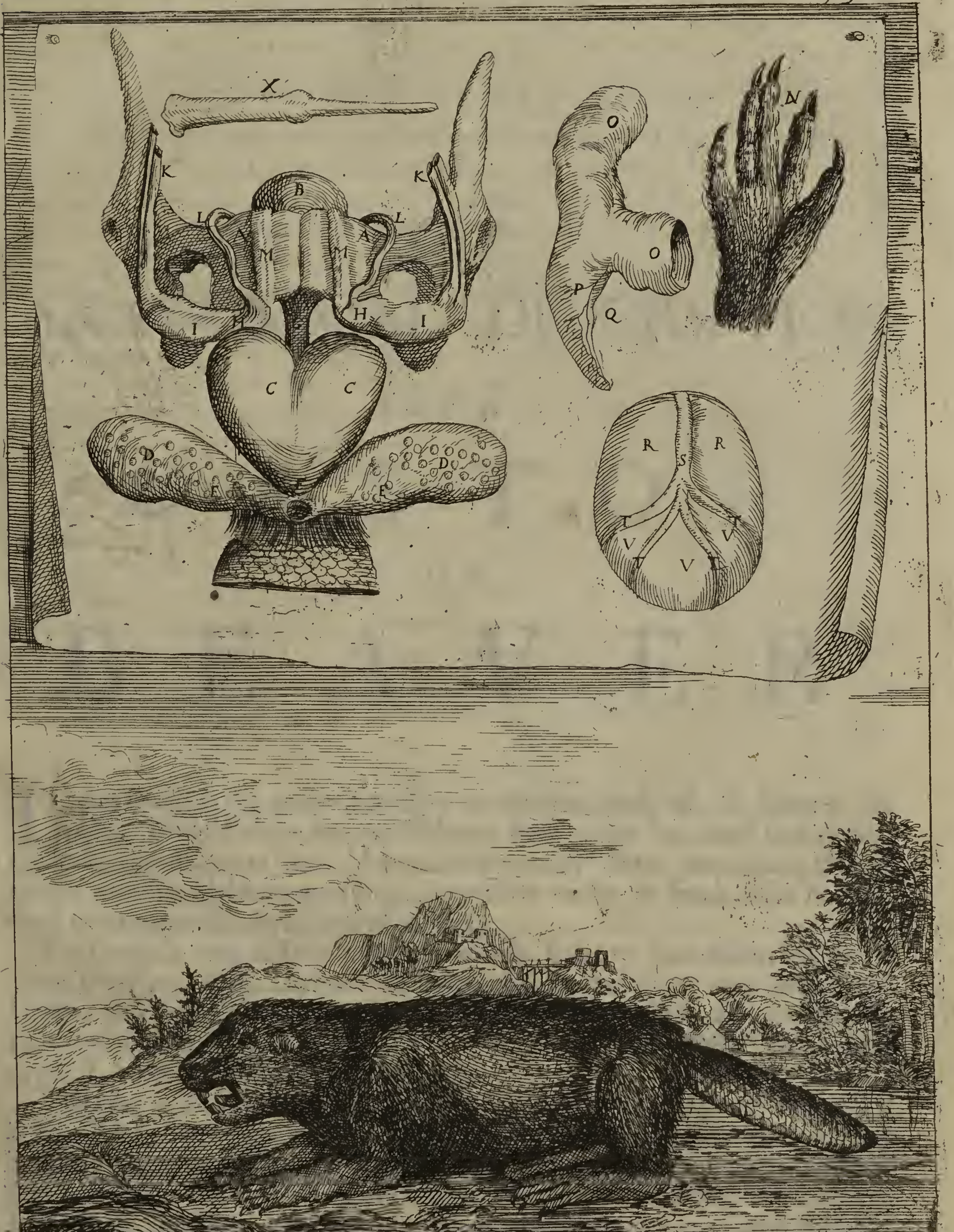

THE ANATOMICAL DESCRIPTION OF A CASTOR OR BEAVER.

IT was ſo much the more neceſſary to obſerve nicely all the Parts of the *Caſtor*, becauſe there has not hitherto been made an exact Deſcription thereof; the Ancients having been almoſt wholly ſilent concerning this Animal, and the Moderns applying themſelves more to ſpeak of its Nature, than to examine the Structure of its Body.

That which was diſſected at the King's Library was taken in *Canada*, about the River of St. *Lawrence*. It reſembled an *Otter*, but was larger and bigger, and weighed above Thirty Pounds. Its length was about three Foot and a half, from the end of the Noſe to the tip of the Tail, and its greateſt breadth was near twelve Inches.

The *Hair* which covered its whole Body, except the Tail, was not every where alike; but there were two ſorts, which were mingled together, and which differed in length as well as Colour. The bigger was about an Inch and half long, and as thick as the Hair of ones Head. Its Colour was Brown, ſomewhat inclining to a Minime or Soot-colour, but very bright; and its ſubſtance was firm, and ſo ſolid, that having cut it croſswiſe there could not any Cavity be ſeen, even with the Microſcope. The leſſer was about an Inch in length; there was ſome much ſhorter than others; it ſeemed likewiſe more ſlender, and was ſo ſoft, that the fineſt down is not ſofter. The mixture of theſe two ſorts of Hair ſo different is found in many Animals; but it is moſt remarkable in the *Caſtor*, *Otter*, and *Wild-boar*; and it ſeems that it is likewiſe more neceſſary for them: For theſe

Animals being ſubject to wallow in the Mire, beſides the ſhort Hair which Nature has given them to defend them from the Cold, they had need of another longer Hair to receive the Mudd, and keep it from penetrating to the Skin.

Its *Head* was five Inches and a half long, from the end of the Noſe, to the hinder-part of the *Occiput*, and five Inches broad at the place of the Bones which do make the Eminency of the Cheeks. This Proportion has made the *Caſtor*, to be by *Herodotus*, put amongſt the Animals which he calls *Tetragonoproſopa*, that is to ſay, with a ſquare Face or Head. Its Ears reſembled thoſe of an *Otter*; they were round and very ſhort, covered with Hair on the out-ſide, and almoſt without any within.

It is ſaid that this Animal delights to knaw Trees, and that it cuts them down to make its Damme or Hole withal; and indeed its *Teeth* were made after a manner very proper for it. At the end of the Noſe it had four *Inciſores*, two in each Jaw, like *Squirrels*, *Rats*, and other Animals which love to nibble. The lower ones were above an Inch long, but the upper were not above ten Lines, and ſlipped within the others, not being directly oppoſite to them. As to their ſhape, they were half round before, and very ſharp at the end, which was cut bevelling on the in-ſide and out-ſide. Their Colour was White on the in-ſide, and on the outſide of a brisk Red inclining to Yellow, almoſt like that of baſtard Saffron. They were both about two Lines broad at the going out of the Jaw, and above a Line at their extremity. Beſides theſe *Inciſores*, there were ſixteen *Molares*, that is to ſay, eight in each ſide, four below, and four above. They were directly oppoſite one to another, and had nothing particular.

As to the Eyes we could not examine them, becauſe that the *Rats*, or ſome ſuch Creatures had eat them.

The Structure of the Feet was very extraordinary, and ſufficiently demonſtrated, that Nature hath deſigned this Animal to live in the Water as well as upon Land. For altho' it had four Feet, like terreſtrial Animals, yet the hindmoſt ſeemed more proper to ſwim than walk with, the five Toes of which they were compoſed being joyned together like thoſe of a *Gooſe*, by a Membrane which ſerves this Animal to Swim with. But the fore-ones were made otherwiſe; for there was no Membrane which held theſe Toes joyn'd together; and this was requiſite for the conveniency of this Animal, which uſes them as Hands (like *Squirrels*) when he eats. The Proportion of theſe Toes, their Situation, and the Shape of the Palm, do make theſe Paws wholly like Hands; and when *Mathiolus* ſays that they do differ from the Hands of an *Ape*, he evidently demonſtrates that he has confounded the *Caſtor* with the *Otter*, which has the Toes of the fore-feet provided with Skins like thoſe behind; which perhaps he has inferr'd from what *Pliny* ſays, that the *Caſtor* is altogether like the *Otter*, except the Tail. The length of the fore-feet was ſix Inches and a half from the *Cubitus* to the end of the great Toe; and three Inches from the beginning of the Hand to the extremity of the greateſt Finger: thoſe behind were longer, and contained ſix Inches from the extremity of the Heel to the end of the longeſt, which was the ſecond Toe. Beſides theſe five Toes, which were all furniſhed at the end with Nails cut aſlope, and hollow in the inſide like Pens, there was in the external Part of each fore and hind-foot, a little Bone which made an eminency, and which might have been taken for a ſixth Toe, had it been ſeparate and divided from the Foot; but as it was not, it ſeemed that it ſerved only to add more ſtrength and firmneſs to the Foot.

The *Tail* is that which has principally made the *Caſtor* to be reckoned in the number of the *Amphibious*: For it has not any reſemblance with the reſt of the Body, and ſeems to partake more of the Nature of *Fiſh* than of *Terreſtrial* Animals. It was covered with an *Epidermis* compoſed of Scales, which a Pellicle joyned together. Theſe *Scales* were about the thickneſs of Parchment, about a Line and half in length, and for the moſt part of an irregular Hexagonal Figure. Thoſe on the upper part of the Tail were very little different from thoſe underneath; ſave that amongſt ſome of the under ones there grew ſometimes one, ſometimes two, and ſometimes three ſmall Hairs, which were bent downwards, and exceeded not two Lines in length. As to the Colour they were of a Dark-gray inclineing to a Slate-colour; but in the joynts the *Epidermis* appeared of a Darker Colour. When the Skin of the *Caſtor* was flead, the Scales of the Tail fell off, but their Figure remained imprinted thereon; and this part of the Skin, where the Scales were, became White, and of a Subſtance like that of the Skin of *Fiſh* as the *Porpoiſe*, or *Sea-Fox*. In diſſecting the Tail we alſo found that the Fleſh thereof was very Fat, and had a great deal of reſemblance with that of Cetacecus *Fiſhes*.

As to the reſt, the bulk and ſhape of the Tail was very remarkable. It was about eleven Inches in length, and at the root it exceeded not four Inches in breadth. From thence it went inſenſibly increaſeing on each ſide to its middle, where it was five Inches; and afterwards it leſſened to the end, where it terminated in an Oval. On the contrary it was thicker towards its root than in all the reſt of its length: For in this place it was near two Inches thick, and decreaſed by little and little towards the other end; ſo that in its middle it exceeded not an Inch in thickneſs, and was reduced to five Lines and a half at its extremitie. The edges of its Circumference were round and ſomewhat thick, altho' they were much thinner than the middle.

The *Hole* through which this Animal caſts its Excrements was ſituated between the Tail and *Os pubis*, about two Inches higher than the beginning of the Tail, and three Inches and half lower than theſe Bones. It was of an Oval Figure, about nine Lines in length and ſeven in breadth. The Skin about it was Black and without Hair, and was eaſily contracted and dilated, not by a *Sphincter* as the *Anus* of other Animals, but ſimply like a ſlitt. This hole was common to the paſſage of the Urine as well as to that of other Excrements: For beſides that the *Anus* or extremitie of the *Rectum* ended therein, a little lower, in the Anteriour Part, there was ſeen to appear the extremitie of this Animals *Penis*.

At the ſides of the inſide of this common paſſage we obſerved two ſmall *Cavities*, one in each ſide, where we endeavoured to introduce a *Stylus*; but we could not make it to paſs from the inſide of the Hole towards the out; and thro' the outmoſt Skin we perceived two Eminencies, which we afterwards found to be the Baggs or Bladders which do contain the *Caſtoreum*: And it being that which is moſt remarkable in this Animal, we examined it with a particular exactneſs.

Naturaliſts have ſpoken variouſly thereof. Some do Aſſert that the *Caſtoreum*

reum is lockt up in the *Teſticles* of the *Caſtor*; and *Ælian* ſays that this Animal knowing that Men do hunt it only to get this Liquor of ſo great uſe in Phyſick, tears off its *Teſticles* when it ſees it ſelf cloſely purſued by the Hunters, and leaves them to them as for its ranſom. Others are of Opinion that the *Caſtoreum* is not found in the *Teſticles* of the *Caſtor*, but in the Bags particularly deſigned to receive this Liquor.

To inform us of the Truth, we ſtript our *Beaver* of its skin; and having taken it away, we diſcovered in the place where we had obſerved theſe Eminencies, four great Pouches fixed underneath the *Os Pubis.* The two firſt were placed in the middle, and higher than the two other. They both together repreſented a kind of Heart, the top of which was about an Inch under the *Os Pubis*; and the ſides, being circularly extended, did approach to re-unite themſelves in the upper part of the common aperture. The greateſt breadth of theſe two Pouches taken together, was a little more than two Inches; and the length from the top of each to the common aperture was likewiſe about two Inches. They appeared externally of an Aſh-colour, ſtreaked with ſeveral white Lines of the ſhape of thoſe which are ſeen in the *Saligot* or *Water-nut.* Their outward Coat was without wrinckle or fold, and appeared clear and tranſparent, ſo that its Colour ſeemed to be borrowed of the Coat which was underneath. And indeed, having opened one of theſe Pouches, we found that the inward Coat was of an Aſh-colour; that moreover it was fleſhy, and that it had on the inſide ſeveral wrinckles like to thoſe of a Sheeps Maw, amongſt which we found ſome remains of a greyiſh matter, which had a ſtinking ſmell, and which was there ſo ſtrongly faſtened that it ſeemed to be a part thereof. Theſe wrinckles were extended into both theſe Pouches, which had communication one with the other, by a hole of above an inch, and were ſeparated only at the bottom.

Underneath theſe firſt Pouches there were two others, one at the right, and the other at the left ſide; each of which had the Figure of a *Pear* ſomewhat flatted, or of a long green *Almond.* They were each two inches and a half in length, and ten lines in breadth. Their greateſt breadth was towards the end fartheſt from the common Paſſage of the Excrements, and ended at the ſides of this hole. Theſe two Pouches were ſo placed, as that they joyntly formed with the ſaid common hole the ſhape of a very open V, from the inſide of which the two firſt Pouches raiſed themſelves like a Heart, as we have already ſaid.

Theſe two lower Pouches were very ſtreightly joyned with the upper, about the common hole; and it is probable that the matter of the *Caſtoreum* having begun to be prepared in the two upper Pouches, paſſeth into the other two there to be perfected, and to acquire more conſiſtence, more oylineſs, more ſmell, and a yellower colour, which appeared very little in the upper Pouches. The ſtructure alſo of theſe Pouches were very different. It ſeemed that the lower ones were compoſed of Glands, like the Kidneys of young Animals: for in their exteriour ſurface there was a great number of ſmall round Bodies, a little riſing, and of a different ſize, the largeſt not exceeding a middleing Lentile. They were all covered over with the Membrane which externally enveloped all the great Pouches, which is nothing elſe but a Continuation of the common Membrane of the Muſcles.

Having opened ſeveral of theſe little Glandulous Bodies, we found that they were compoſed of a ſpongie Fleſh of a whitiſh colour inclining to a red, and that they all had a conſiderable Cavity: ſo that it ſeemed as if they were ſo many little Pouches; but there was no Liquor in them, nor any other remarkable Subſtance.

We, judging by the Touch that there was ſome Liquor in the Pouches, of whoſe ſurface theſe little Bodies made a part, opened one at the bottom, keeping that of the other ſide to ſave the Liquor. Out of this hole there came a ſtinking Liquor, yellow as Honey, unctuous as melted Fat, and combuſtible as *Turpentine*; for it took fire being put to the flame of a wax-candle. We would have ſeen whether by ſqueezing there would not be a reflux of this humour into the upper Pouches, or into the common paſſage of the Excrements; but neither the one nor the other fell out.

Having afterwards emptied the Liquor of this ſecond Bag we perceived that in its lower part there was a third Pouch about fourteen lines in length, and ſix in breadth, which was likewiſe full of Liquour, and ſo faſtened to the Membrane of the ſecond Pouch, that it could not be ſeparated. It went ſloaping to a point on the lateral part of the common hole; but we perceived not that there was any paſſage into the Cavities which we have ſpoken of in deſcribing this hole; for we could make nothing go out that way. In the external ſurface of the third Pouch there were little glandulous Bodies like thoſe which we obſerved in the ſecond. In this third Pouch we found a Juice, yellower, more liquid, and better digeſted than in the others. It had alſo a different ſmell, and greatly reſembled the yolk of an Egg, but its colour was ſomewhat paler.

Tho it was propoſed in this diſcourſe to ſpeak only of the Obſervations made in the Diſſection of the *Caſtor*, it will be no digreſſion to relate what has been ſince written from *Canada* touching the *Caſtoreum.* It is reported that the *Caſtors* do uſe this Liquor to create themſelves an Appetite when they have no Stomach; that they do get it out by ſqueezing with their Paw the *Veſicles* which do contain it; and that the *Savages* do therewith rub the Snares which they lay for theſe Animals on purpoſe to entrap them. *Rondeletius* had well obſerved that the *Caſtors* do frequently lick up this Liquor; but he ſpeaks not of the particular uſes which are told us that the Animal and Savages make thereof.

But to return to the Pouches which contain the *Caſtoreum*, it is evident by the accurate Deſcription which we have already made thereof, that they are not the Teſticles of the *Caſtor*, as ſeveral Naturaliſts have imagined, whoſe Error will likewiſe more evidently appear, by what we ſhall afterwards ſpeak of theſe Teſticles.

Sextius, according to the relation of *Pliny*, derided thoſe who believed that the *Caſtor* tears off his Teſticles, when cloſely purſued by the Hunters, and ſaid that it was impoſſible, becauſe that this Animal hath the Teſticles faſtened to the Back-bone. But he confutes one error by another. For as *Dioſcorides* has very well obſerved, the Teſticles of the *Caſtor* are concealed in the Groins, and not faſtened to the Back-bone. Nevertheleſs *Amatus Luſitanus* and *Mathiolus*, who have both Commented upon *Dioſcorides*, and who ſay that they have Diſſected *Caſtors* in the preſence of ſeveral Phiſitians, do averr that they have found theſe Teſticles ſo faſtened to the Back-bone, that they had great difficulty to ſeperate them with a Launcet. *Rondeletius* runs into the ſame error, altho he has examined a little better than other Authors the Pouches from which the *Caſtoreum* is taken, but yet very negligently, not to perceive that they are four in number; for he reckons but two. There are ſome more Modern Authors who have not gone much farther than the other, contenting themſelves with knowing that the Teſticles are different from theſe Pouches; and have ſo ill underſtood *Dioſcorides*, as to believe that when he ſays the Teſticles of the *Caſtor* are hid in the Groins, he took the Pouches for them. But experience hath demonſtrated to us that all theſe Authors are miſtaken, if all *Caſtors* are like to that which we Diſſected: for the Teſticles were no more on the inſide than the Pouches; they were only a little higher at the external and lateral parts of the *Os pubis*, in the place of the Groins, where we found them wholly concealed, ſo that they appeared not outwardly no more than the *Penis* before that the skin was taken off. Their Figure and Shape was very like to the Stones of *Dogs*, ſave that they were longer and leſſer in proportion to their length. They were little more than an inch long; their breadth was half an inch, and their thickneſs ſomewhat leſs. As to the *Epididymis* and all the Veſſels neceſſary to Generation, they differed in nothing from thoſe of *Dogs*.

The *Penis* appeared more ſingular to us. In its extremity inſtead of the *Balanus* it had a Bone fourteen lines long, and made like a *Stylus*, which was two lines broad in its baſis, and ſuddainly ſtraitning it ſelf, ended in a point. There was this alſo remarkable, that whereas the *Penis* of *Dogs* re-aſcends from the *Os pubis* towards the *Navel*, this deſcended downwards towards the paſſage of the Excrements, where it ended. It was, as we have ſaid, concealed; ſo that before the skin was taken off we perceived it not, and we could not diſcern of what Sex this Animal was.

The better to examine theſe Parts, we opened the lower *venter*; and having traced the *Spermatick* Veſſels to their *Origine*, we found them like to thoſe of *Dogs*, and other Animals. We obſerved likewiſe that the *Penis* was laid upon the *Rectum*, and that it paſſed underneath the two firſt Pouches of the *Caſtoreum*, to which it was cloſely joyned: that moreover theſe Baggs received their Veins and Arteries from the *Hypogaſtrick* Veins and Arteries, there being no appearance that there were other Veſſels which could furniſh the matter whereof the *Caſtoreum* is formed, unleſs it be imagined that it is cauſed by the *Vret* which is improbable.

As to the other parts of the lower *Venter* the Muſcles of the *Abdomen*, *Peritonæum*, *Stomach*, and *Bladder*, had nothing remarkable, and their Structure was altogether like that of *Dogs*.

The *Inteſtines* had little conſiderable, except the *Cæcum*, which was two inches and a half in breadth, and ten in length. It was unuſually ranged on the left ſide underneath the *Spleen*, from whence it deſcended to the Cavity of the *Ileum*, and terminated in a round point, making an Appendix of an inch in length: It was that which made us to diſtinguiſh this *Inteſtine* from the others. Its Figure was not ſtrait, but a little crooked, like the blade of a Scythe. In the concave part of this bending there was a Ligament, and in the convex another, both like to thoſe which are commonly found in the

Colon of Men; and theſe Ligaments were accompanied with Veins and Arteries which came from the *Venæ Meſentericæ*, and ſpread from ſpace to ſpace their branches into the Body of this *Inteſtine*.

Two fingers underneath the great end of the *Spleen*, there lay a little Spherical Body very extraordinary, which appeared of the ſame Subſtance as the *Spleen*, altho it was remote from it; It was three lines Diameter.

The other *Inteſtines* were ſo little different from one another, that we could never diſtinguiſh the *Colon*. They were near twenty eight foot long. Having opened them we found in the inſide eight Worms long and round, like to Earth-worms, three whereof were between ſeven and eight inches long, and the reſt about four.

The *Spleen* was laid along the left ſide of the Stomach, to which it was faſtened by eight Veins, and as many Arteries, which made ſo many *Vas Breve's*. Its Colour was very Red: Its length ſeven inches, and its thickneſs almoſt equalled its breadth, which was about ten lines.

We obſerved nothing particular in the *Liver*, ſave that it was divided into five Lobes of the ſame Colour, as the Lobes of a *Dogs* Liver.

The *Gall-Bladder* was hid under the hollow part of the Liver between two of its Lobes. It was two inches and a half in length, and near an inch in breadth. All the lower *Venter* was overflowed with a diffuſed Choler, which had perhaps occaſioned the death of this Animal.

The *Pancreas* was nothing different from that of *Dogs*. Its length was ten inches, but it exceeded not two in its greateſt breadth.

Though this *Caſtor* was very Fat, eſpecially through the Belly and Tail, yet there was found very little in the *Tunica adipoſa* of the *Kidneys*, and in the *Epiploon*. Each *Kidney* was an inch in thickneſs, near two in length, and as much in breadth at the middle.

The *Cartilago Xiphoides* was round, and fourteen lines broad; but very thin and pliable.

Having afterwards opened the *Thorax* we obſerved little difference between all the parts which were there incloſed, and thoſe of *Dogs*. The *Lungs* had ſix Lobes, three on the right ſide, two on the left, and another little one which was in the *Mediaſtinum* near the Center of the *Diaphragme*.

That which was moſt remarkable in the *Heart*, is that the left *Auricle* was larger than the right; which is likewiſe ſeen in ſome other Animals; but not in *Man*, who on the contrary has the right *Auricle* of the *Heart* bigger than the left.

We the more carefully ſought after the *Foramen Ovale*, which ſeveral Modern Authors have averred to be found in all *Amphibious* Animals, and even in *Men*, who do often dive and ſwim a long time in the water. But what exactneſs ſoever we uſed in the ſearch, we could not diſcover that hole in the *Heart* of our *Caſtor*. It is true that as it had been ſeveral years penn'd up at *Verſailles*, without having the liberty of going into the Water, it might be that this hole was cloſed up, even as it happens to the *Fœtus*, after it is born, and has breathed ſometime. Indeed it ſeemed that in this place there had formerly been a hole which was ſince grown up.

Under the *Vena Coronaria* we found the *Valve* called *Noble*, which fills the whole Trunck of the *Vena Cava*, and which was ſo diſpoſed, that the Blood

might

might eaſily be carried from the *Liver* to the *Heart* by the *Vena Cava*, but which is hindred from deſcending from the *Heart* towards the *Liver* through the ſame Vein.

The *Heart* was two inches and a half long from the baſis to the point, and almoſt two inches broad.

In the Diſſection which we made of the *Brain*, the Figure of the *Sinus* of the *Dura Mater* appeared to us very ſingular. The upper *Sinus* which came from the ſide of the *Os Ethmoides* divided the *Brain* into the right and left ſides; and advanced in a ſtreight line to the beginning of the *Cerebellum*, where being arrived it was divided into two great branches almoſt in the form of a Y, which on the right and left did divide the *Cerebrum* from the *Cerebellum*. Theſe two branches produced four others; two on each ſide, which by returning towards the hinder part of the Head, divided the *Cerebellum* into three unequal parts; that of the middle, which was the greateſt, was ten lines in length, and five in breadth, and was Oval: the two other lateral ones were four lines and a half broad, and ſix long. The whole extent of the *Brain* was in its greateſt length, from the Noſe to the Temples, but an inch and eight lines, and an inch and half in its breadth.

Having raiſed the whole Body of the *Dura Mater* by the Anterior part we found no *Falx* under the great *Sinus*. There was only a little Cavity which was formed by the roundneſs of the *Sinus*, and under the Branches of that *Sinus* there was ſeen to appear ſome prints of the like Cavities.

The ſeparation of the *Brain* from the *Cerebellum*, was diſtinguiſhable only by thoſe ſorts of prints, which were not deep. The *Cerebellum* took up all the hindermoſt part of the Head. The *Brain* had but very little *Anfractuoſities*; and its external part ſeemed rather White than Aſh-coloured. The reſt of the *Brain* was like to that of other Animals. The *Mamillares Proceſſus* were very large; but the *Optick Nerves* were very ſmall at their going out of the ſubſtance of the *Brain*, and they went joyned together after an extraordinary manner, by reaſon of the length of this Conjunction, which was ſeven lines; they were afterwards divided after the uſual manner to go to the Eyes, which for an *Orbita* had only a bony Circle.

As to the *Fleſh* of the *Muſcles* and of all the reſt of the Body, we found nothing particular ſave that the Fleſh of the Tail, as we have already obſerv'd, was different from that of the other Parts.

The Explication of the Figure of the OTTER.

THat which is remarkable in the lower Figure is the Structure of the Paws, whoſe Toes are faſtened each to other by skins as in the *Gooſe*; The Teeth which are ſharp and different from thoſe of the *Caſtor*; and the Ear which is little as in the *Caſtor*, but a great deal lower.

In the Upper Figure.

A B. *The* Kidney *covered with its* Membrana Adipoſa.
C C C. *The ſeveral little* Kidneys *diſcovered, the* Membrana Adipoſa *being taken off.*
D D. *The* Ureters.
E E. *The* Emulgent Veſſels.
e. *The* Clitoris *drawn inwards.*
F F. *The* Nymphæ.
H. *The* Anus.
i. *The* Clitoris *drawn outwards.*
L. *The Bone in the* Clitoris.

THE
ANATOMICAL DESCRIPTION
OF AN
OTTER.

SOme Authors have confounded the *Otter* with the *Caſtor*, by reaſon of the great reſemblance that is between theſe two Animals; but the generality do agree that they are different in ſeveral things. We have remarqued ſome which we have not as yet heard ſpoken of; and there are likewiſe a great many Particularities which are attributed to the *Otter*, and which are pretended to be common to it with the *Caſtor* or *Beaver*, which we found not in our Subject.

Pliny, *Belonius*, and almoſt all the Natural Hiſtorians, do ſay that the *Otter* and *Caſtor* are only different in the Tail, which is covered with Scales in the *Caſtor*, and which is Hair in the *Otter*. *Georgius Agricola* and *Albertus* do make the four Feet of the *Otter* like thoſe of a *Dog*. All the other Authors do report that it has them like to thoſe of the *Caſtor*: we found neither the one nor the other in our *Otter*. *Herodotus* ſays that the *Caſtor* and *Otter*, even as the other Animals which he calls *ſquare-headed*, have this in common, that their *Teſticles* are proper to the Diſtemper of the *Mother*, and *Braſavolus* affirms that they both have the ſame Virtue againſt the *Epilepſie*, *Palſie*, and all the Maladies of the Nerves: In which it appears that theſe Authors have made no diſtinction between the *Pouches* of the *Caſtor* and its *Teſticles*, becauſe that the Pouches are only made uſe of in the Diſtempers of the *Mother* and Nerves. *Ariſtotle* has likewiſe attributed to the *Otter* a particularity which *Pliny* reports of the *Caſtor*, which he declares to be ſo inraged againſt Man, that when he bites him, he never quits his hold until he feels the Bone of the Parts which he has ſeized to crack under his Teeth.

The *Greek* word λουτρὸν, from whence the word *Lutra* is derived, and which ſignifies a *Bath* or *Bagnio*, ſeems to diſtinguiſh it from the *Caſtor*, becauſe that it plunges only into Freſh-water, and never into the Sea, the water whereof is not proper to waſh with, nor to make a Bath; and that the *Caſtor* goeth indifferently into the Sea and Rivers.

The ſize of the *Otter*, and the Proportion of its Parts, did alſo render it very different from the *Caſtor* that we Diſſected; for the *Caſtor* was three foot and a half long comprehending the Tail; and the *Otter* had in all but three foot two inches, and its Tail was proportionably much longer; which made the reſt of the Body leſſer than that of the *Caſtor*. The *Head* of the *Caſtor* was five inches and a half from the Noſe to the hinder part of the Head, and that of the *Otter* exceeded not four and a half. The *fore-feet* of the *Caſtor* were ſix inches and a half from the *Cubitus* to the end of the Toes, and thoſe of the *Otter* not above five. The *hinder-feet* of the *Caſtor* were ſix inches from the Heel to the end of the Toes, and thoſe of the *Otter* but three and a half.

This does likewiſe render our *Otter* very different from that which *Bellonius* deſcribes, in which he makes the Leggs to reſemble thoſe of a *Fox*, and only different in this that they are bigger; unleſs he would be underſtood to ſay that they are bigger in proportion to their length: but the truth is, that in proportion to the reſt of the Body they are a great deal ſhorter than a *Foxes*, being in this like to thoſe of a *Weaſel*, which has a long Body and ſhort Leggs.

The *hinder feet* wholly reſembled thoſe of the *Caſtor*, having five long and ſlender *Toes*, not cloſe together like thoſe of a *Dog*, and the intervals had a skin, as in the feet of *Geeſe*. The *fore ones* were like thoſe behind, and very different from the fore-feet of the *Caſtor*: For theſe toes were joyned by Membranes as thoſe behind, excepting that the Membranes held them cloſer together; but they had not that reſemblance which thoſe of the *Caſtor* have to a Hand; the five *Toes* being equal, having each their three *Phalanges*, and the *Pollex* not being more ſeparate from the other Toes than the reſt are from each other.

The *Noſe*, *Eyes*, and ſhape of the whole *Head*, did hardly render it different from the *Caſtor*: The *Teeth* only were unlike, not being ſharp, nor ſo ſtrong as thoſe of the *Caſtor*; which made us to think that *Ariſtotle* has miſtaken the *Otter* for the *Caſtor*, when he exaggerates, after the manner already ſhewn, the ſtrange force of its Biting: for our *Otter* had not thoſe four great and long *Inciſores* which are particular to the *Caſtor*, and ſome other Animals, as the *Hare*, *Squirel*, and *Rat*; all the Teeth being made like thoſe of the *Dog* or *Wolf*, and the *Canini* being, as is uſual, longer than the *inciſores*. So that theſe Teeth made all the reſemblance that we found the *Otter* to have with the Dog, altho *Bellonius* reports that it has its Head, and *Ælian* calls it the *River-Dog*. The *Ears* which were little, as in the *Caſtor*, were lower than the Eyes, and ſituated near the lower Jaw.

The *Hair* was not half ſo long as that of the *Caſtor*, containing in that place of the Body where it was longeſt, but eight lines; whereas that of the *Caſtor* was eighteen. Its *Colour* was in ſome meaſure different from that of the *Caſtor*, but not after the manner as Authors do expreſs it: for they do report that the Hair of the *Caſtor* inclines more to Grey, and we have found the contrary; our *Otter* having the Hair underneath its Throat, Stomach, and Belly much Greyer than it was in our *Caſtor*. The Hair of the Tail was ſhorter than upon the Body, but a great deal longer than on the Feet. The reſt of the Hair *viz.* on the Head and Back, was of a Colour reſembling that of the *Caſtor*, being of a dark *Cheſnut*, and of two ſorts, the one longer, Browner, Straiter, and thicker; the other ſhorter, grayer, more frizled, and ſofter.

To finiſh the Deſcription of the outſide, it remains to ſpeak of a Particular very remarkeable, and which greatly diſtinguiſhes the *Otter*, not only from the *Caſtor*, but even from other Brutes, which is the extraordinary Formation of the exteriour Orifice of the *Matrix*, where we found the *Nymphæ* and a *Clitoris* as in Women. The *Clitoris*, which was ſituated at the ſuperiour part of the *Nymphæ*, and beyond their junction, was three lines in length. It was compoſed of Membranes and Ligaments which incloſed a Bone two lines long.

The generality of the Parts which were ſeen by the Diſſection, were yet more different from thoſe of the *Caſtor* than the exteriour are. The *Liver* which contained but five *Lobes* in the *Caſtor*, had ſix in our *Otter*. The *Spleen*, which was *Cylindrical* in the *Caſtor*, and very ſmall, not exceeding ten lines Diameter and ſeven inches in length, was flat in the *Otter*, being an inch and half in breadth and four and a half in length. But its Connexion was ſo particular that it was not only different from that of the *Caſtor*, but from almoſt all other Animals, in which the *Spleen* is generally faſtened to the Stomach; whereas in our *Otter* it was at the *Epiploon*.

The *Kidneys* were three inches long and two broad. In the *Caſtor* they were not two in length: but the principal difference was in the Conformation which was ſo extraordinary, that it reſembled that of the Kidneys of a *Bear*; thoſe of the *Otter* differing only in the number of little Kidneys, whereof the one and the other are compoſed: for inſtead of fifty two little Kidneys which we found in the *Bear*, there were only ten in the *Otter*, which were ſeperated one from the other, each having their *Parenchyma*, *Vena*, and *Arteria Emulgens* apart, with a third Veſſel, which was a branch of the *Pelvis*, which the dilatation of the *Vreter* produced, and ten branches of which went to each little Kidney one. Theſe little Kidneys, beſides a common Membrane that enveloped them, had ſtore of Fibres which tied and collected them into a heap, which had a Figure ſomewhat longer than the Kidneys uſually have; and there was one of theſe ſmall Kidneys which was a little more ſeparated from the reſt, and which extended this Figure towards the top, ſo that this little Kidney might be taken for the *Capſula Atrabilaria*.

The *Pancreas* was compoſed of conglomerated Glands like that of the *Caſtor*, and generality of other Animals, but they appeared more diſtinct and ſeparate one from the other than uſual.

The *Lungs* as in the *Caſtor* was compoſed of ſeven Lobes, ſix of which was equal in ſize, and the ſeventh very ſmall, which ſeemed only an Appendix of the ſixth.

We carefully ſought in the *Veſſels* of the *Heart* that *Foramen Ovale* which is thought to be in Animals, whileſt they do remain without breathing in the Belly of their Damme, for ſupplying the uſe which is attributed to Reſpiration, which is, to aſſiſt the Circulation of the Blood which is made through the Lungs, by means of the dilatation, and compreſſion of this part. We had formerly made this ſearch in the *Caſtor*, becauſe that ſome have thought that that Animal had need of this conformation of the Veſſels of the Heart, to make it able to indure the ceſſation of Reſpiration which it undergoes when it plunges and dives a long time under Water; but we found not this *Foramen* open, nor that there were other Conveyances which might grant paſſage to the Circulation of the Blood than thoſe which are in the Lungs. Yet the Truth is, that we obſerved ſome *veſtigia* of this Aperture, which ſeemed to demonſtrate that it had not been long cloſed: which appeared to us the more probable, for that we were aſſured that the *Caſtor* had been a long time ſhut up in his Hutt without having liberty to plunge into the Water, and that it might happen that this *Foramen* was ſtopped as it uſually is in all Animals a little after their Birth, when the faculty which they have of breathing renders this *Foramen* uſeleſs. But in our *Otter* we found not any appearance that there ever had been a *Foramen* which might grant paſſage to the Blood from the *Vena Cava* into the *Arteria Venoſa*: and this ſufficiently agrees with the Remarques which all Authors have made that the *Otter* is ever and anon forced to raiſe it ſelf above the water to Breath; which the *Caſtor* does not, having a much greater facility of wanting Reſpiration for a conſiderable time.

The other Parts which have been carefully Diſſected, have furniſhed us with nothing conſiderable, and which deſerves to be remark'd.

The Explication of the Figure of the Civet-Cat.

IT is diſpoſed in ſuch a manner that one may ſee the Situation of the Pouches in which are the Receptacles of the Odoriferous Liquor, and the three Apertures which are peculiar to this Animal, and which are more diſtinctly repreſented in the upper Figure.

In the Upper Figure.

A A. *Is the End of the* Penis *forceably drawn outwards.*
B B. *The* Anus *of the Male and Female.*
c c. *The External Orifice of the* Uterus.
D D.. *The place where the Tail is cut off.*
e. An *Eminence being a kind of* Clitoris.
F F. *The* Pouches *wherein are the Receptacles for the Odoriferous Liquor, covered with their proper Skin, and in their Natural Situation.*
G G. *The ſame* Pouches *uncovered and turned downward.*
H H. *The ſame* Pouches *yet more uncovered, the Muſcles being taken off.*
I. I. *The two Apertures of the Sack, or Receptacles of the Odoriferous Liquor.*
K· *The Uniteing of the three Muſcles of the Pouches, or Scent-bags.*
L. *The Sheath in which the* Penis *lyes concealed.*
M. *The Neck of the* Uterus.
N. N. *The* Teſticles *of the Male, brought ſideways to ſhew them, their Natural Situation being under the* Pouches .
O. O. *The* Teſticles *of the Female.*
P. P. *The* Cornua Uteri.
Q. Q. *The* Cremaſter-Muſcles.
R. *The* Bladder.
S. S. *The Extreamitie of the* Cornua Uteri *haveing ſome reſemblance to the* Tuba.

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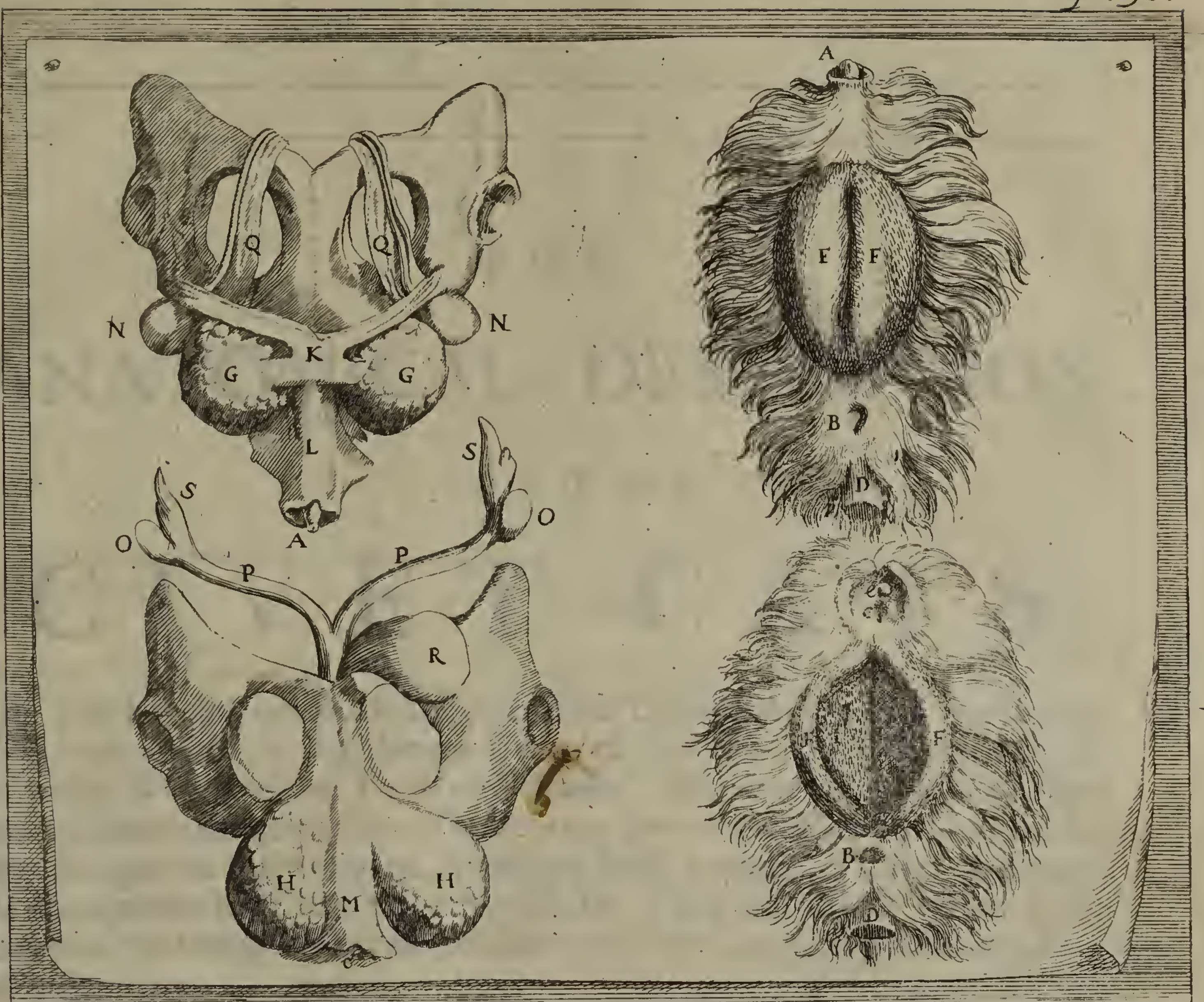

THE ANATOMICAL DESCRIPTION OF TWO CIVET-CATS.

AFter haveing made the Diſſection of a *Caſtor* and *Otter*, an opportunity offered of joyning thereunto that of two *Civet-Catts*, which dyed the following Winter in the Parke of *Verſailles*. We were very glad of being able to make the compariſon of theſe two Species of Animals, becauſe that they do agree in ſome Organs, which are very peculiar to them, which are the Receptacles in which there is collected a Liquor, whoſe Odour is remarkable, for being extreamly pleaſant in the one, and very diſagreable in the other.

We at firſt ſought whether there was not ſome particular Reaſon of this diverſity of Scent, but we found not that there was apparently any other than the diverſitie of the Temperament of theſe Animals; for the one is hot and dry, drinks little, and inhabits hot and dry Countryes; the other lives ſometimes in the Water, and ſometimes on the Land: and as it has a great deal of humiditie, by reaſon that it participates of the Nature of *Fiſh*, it has not Heat enough to Concoct and perfect this humiditie. So that ſuppoſe that the good and bad Scent do's proceed from the Concoction or Cruditie which the Natural heat more or leſs Powerful operates on the Humours, the *Caſtor*, whoſe Natural heat is weakened, and as it were ſtifled by the abundance of its moiſture, can only imperfectly Concoct it, and produce only a very unpleaſant Scent.

The two *Civet-Catts* of which we made the Diſſection, were Male and Femal, but ſo like in all outward appearance, that there ſeemed no diſtinction of Sex; it being impoſſible without Diſſection, to judge whether they were not both Females. For the parts which are proper to the Male, were hid and lockt up in the inſide; and the Veſſel or Receptacle of the Odoriferous Liquor, whoſe aperture has been taken by moſt of the Ancients for a mark of the Female, was alike in both the one and the other of our *Civet-Catts*.

From the Mouth to the begining of the Tail they were Twenty nine

Inches long. The Tails of both had been cut. That which was the longeſt contained ten Inches. The *Feet* were very ſhort, eſpecially those before, which from the Belly to the ground exceeded not five Inches. The *Paws*, as well thoſe before as behind, had each five *Toes*, the leaſt of which was inward like a *Bear's*; but this little Toe touched not the ground. Beſides theſe five Toes there was a *Spur* which was armed with its Nail like the Toes. The *Nails* were black, ſtrait and very little Pointed. The Sole was furniſht with a Skin very ſoft to the touch. The *Ears* reſembled the figure and ſize of thoſe of a *Catt*; but they were leſs Pointed, and ſmaller: The reſt of the Head had nothing which participates of this Animal but the Beards, which are common to the generalitie of *Carnivorous* Animals. For the Head was ſtrait; the Mouth long; the Tongue ſoft; the Eyes little, Black, troubled and long; the *Dentes Canini* ſhort, and blunt, ſo that they did ſeem to have been broken: and it is probable that this Fierce and Cholerick Animal do's ordinarily break its Teeth by biteing the Iron barrs of its *Cage*. The Neck was ſtrengthened and fortified by Ligaments, and Muſcles extraordinary ſtrong. *Bartholinus* has obſerved that they are far more numerous in other Animals.

The *Hair*, which was ſhort on the Head, and Paws, was very long on the reſt of the Body, being four Inches and a half on the back, where it is longeſt. Amongeſt this long Hair, which was hard, harſh, and ſtrait, was intermixt another ſhorter, ſofter, and frizeled like Wool, as in the *Caſtor*, but it was not ſo fine: It was all over of the ſame Colour, *viz.* a dark-Gray. The great hair was of three Colours, makeing Spots and Liſts, ſome black, others White, and others Red. There were ſome of theſe Hairs which were of two Colours, being Black towards the middle, and White ſometimes towards the Root, ſometimes towards the other end. The four *Feet* were Black, as alſo the Belly and bottom of the Throat, contrary to the Nature of other Animals, which alwayes have the Belly and Throat of a lighter Colour than the reſt of the Body, when all the Hair is not of the ſame Colour. The reſt of the Body was intermixt with three Colours, amongſt which Black was the cheif. There were two great black Spots at the ſides of the Mouth, which incompaſt the Eyes, and left the reſt very white, excepting the Noſe which was black. The Crowne of the Head, from the Eyes to the Ears was gray, by the mixture of the white and black which was in every hair, as has been ſaid, all the ground being black, and the extremity white. The *Ears* which were all Black on the outſide, and only Liſted with White, were filled in the inſide with a long white Hair. The *Neck* had on each ſide four Black *Liſts* on a very White ground; and theſe Liſts which began underneath the Ears, deſcended obliquely towards the Stomach. The middle of the Back was covered with three Liſts; the middle one was Black, and thoſe of the ſides Rediſh. The *Shoulders* and ſides unto the Flanks were marked with a great deal of Black and little Red. The *Flanks* were equally ſtreaked with Black and White, but theſe ſtreaks were not ſo continued as thoſe of the Neck; they were rather the ſpots which *Pliny* calls *Eyes* in the *Panther*, but few of which were ſingle, the greateſt part being joyned to each other. The Tail was Black at top, and mixt with a little White underneath.

The *Aperture* of the *Pouch* or Sack which is the Receptacle of the *Civet*, was underneath the *Anus*, and not under the Tail, as *Ariſtotle* places it in his

Hyena,

Hyæna, which we together with *Belonius* judged to be nothing elſe but our *Civet-Catt*; or at leaſt that our *Civet-Cat* is a *Species* of *Hyæna*. And this being ſo, it is very ſtrange that this great Perſon, who reprehends *Herodotus* for being miſtaken, when he thought that the Aperture of this Pouch was the part which denoted the Sex of the Female, and who excuſes him upon this Account, that it is difficult not to be deceived, if the thing be not carefully examined, ſhould ſuffer himſelf to run into the ſame miſtake, and write in ſeveral places, that the *Anus* and Parts of Generation in both Sexes are below the Pouch.

This *Pouch* was between the *Anus* and another little Aperture, from which it was two Inches and a half diſtant; but it was nearer the *Anus*. This Pouch was two Inches and a half in breadth, and three in length: Its Aperture which was a ſlit from top to bottom, was two Inches and a half. At the edges and in-ſide it was covered with a ſhort Hair turned inwards, ſo that it was rough outward. By parting the two ſides of this Aperture, the in-ſide was ſeen, the capacity of which would contain a ſmall *Pullat's* Egg; the bottom thereof was pierced on the right and left ſide, with two *Foramina* capable of receiving the Finger, which did each penetrate into a Sack, ſupply'd with a White and Rough Skin like that of a *Gooſe*. The Eminencies which made this inequality, were pierced with as many Pores, out of which was made to come, when ſqueezed, the odoriferous Liquor, which the *Arabians* do call *Zibet*, which ſignifies Froth, and from whence is derived the Word *Civet*.

Indeed, this Liquor was frothy in coming out; which was known by this that ſometime after it loſt the Whiteneſs which it had at the firſt. It proceeded, as far as we could judge, from a great number of Glands which were between the two Tunicles, of which the Sacks were compoſed.

The little Aperture which appeared underneath the great Pouch, was the entrance of a *Ductus*, in which the *Penis* of the Male was concealed; and the Female had ſuch a *Ductus*, which was the Neck of the *Matrix*, whoſe internal Orifice was ſo ſtrait, and ſo difficult to dilate, that it was very hard to make a little *Probe* to enter therein. The external Orifice was covered with two little Eminencies ſomewhat longiſh, which were joyned together, and made an Angle, underneath which there was a third Eminence which appeared to be the *Clitoris*.

At the opening of the *Belly* there was found under the Skin from the *Os Pubis* to the Navel, two Eminencies of hard Fat, an Inch broad and thick, and four long. They incloſed the Branches which do paſs from the *Hypogaſtrick* Veins and Arteries, into the two Sacks which do make the great Pouch, there to convey the Matter whereof the ſweet-ſmelling Liquor is made, and which is there collected. *Bartholinus* has very carefully ſearcht after, tho' not found, the particular *Ductus*'s, which he thought to be neceſſary for the conveying this Matter: But our Opinion is that there needs no other than the Arteries, juſt as the *Papillæ*, and Kidneys have no other which do convey to them the Matter of the Milk and Urine; there being a Faculty in the Glands, that are lockt up in the Sacks of the Receptacle of the *Civet*, which makes them to receive into the Arteries, that which is proper to be converted into odoriferous Liquor, even as the Glands of the *Papillæ* do imbibe the Matter which they do find in the Blood, proper to receive the Character of Milk.

Theſe Veſſels which went to the Bags of the Receptacle were very great in the Male; but could hardly be perceived in the Female. The *Civet* of the Male had alſo a ſtronger and pleaſanter Odour than that of the Female. Yet Authors do almoſt all ſay the contrary; and *Quadramius* in his Treatiſe of *Theriaca* preferrs the *Civet* of the Female to that of the Male, which he reports to be nothing worth, if not mixed with that of the Female. We found it not to be true that the Scent or ſmell of the *Civet* is perfected, after long keeping, nor that being new it had an abominable Scent, as *Amatus Luſitanus* reports;for its ſmell ſeemed no better to us after a year,than when we made the Diſſection. *Plutarch* ſays that not only the Skin, but likewiſe the Fleſh and Bones of the *Panther* have a good Scent; but we found not that the pleaſant ſmell of the *Civet* was communicated to the inward parts;for it was the Hair only that had a good ſmell, and eſpecially in the Male,whoſe Hair was ſo perfumed, that the hand which had touched it did a long time retain a very pleaſant and agreeable ſmell: which ſeems to confirm and ſtrengthen the Opinion of *Scaliger*,*Mathiolus*,and ſeveral others, who do think that the perfume of the *Civet-Cat* is nothing elſe but its Sweat; ſo that it is gathered as *Marmol* affirms, from the Animals which do produce it, after they have been well chaced in their Cage; and that it is gathered not only from their Pouches, but likewiſe from ſeveral other places, and eſpecially from about the Neck: there being a probability that tho this Sweat proceeds indifferently from the whole Body, it gathers more abundantly in the *Bags*, and there grows to greater Perfection.

Theſe *Pouches* or *Bags* had ſome Muſcles, which *Bartholinus* mentions not, altho he has marked them in his Figures. Thoſe which we found were different from thoſe which he repreſents, as well in Number as in Structure. He puts down four, which proceeding from the neighbouring parts, are joyned to the Pouches. Thoſe of our *Civet-Cats* were but three in number,of which there was one, which taking its Origine at one of the Pouches, went to inſert it ſelf to the other: the two others took their Origine from the lower part of the *Iſchium*, and each came to be joyned to its Antagoniſt at the middle of the two Pouches, and was faſtened to the Pouch over which it went to make this Conjunction.

It were eaſie for us to conjecture what ought to be the Action of theſe Muſcles by their ſtructure and ſcituation: for that which is common to the two Pouches, muſt be for their Conſtriction, by drawing one to the other; and thoſe which do come from the Bones of the *Iſchium*, do draw the two Pouches together, ſometimes on the right ſide, ſometimes on the left, according as one of the Muſcles is contracted, whilſt its Antagoniſt is relaxed. The uſe of theſe motions is very probably for the preſſing and ſqueezing out the Odorous Liquor, the retention of which is inſupportable to theſe Animals, when by time it has acquired a picquant Acrimony, which excites them to ſqueeze it out: for it is obſerved that *Civet-Cats* do ſeem to have a reſtleſneſs which agitates and torments them, when they have gathered ſtore of this Liquor, which they are conſtrained to let out.

The *Epiploon* was double and ſquare as uſually, but very great. It deſcended to the *Os pubis* and was compoſed of rows of Fat which incloſed the Veſſels. Theſe rows or bands had each three Angles, and were joyned together by a texture of Net-like Fibres.

The *Inteſtines* were not very long, but eſpecially the *Inteſtina craſſa*, which all three together exceeded not ſix inches. On the contrary, the *Spleen* was extraordinary long, containing above ſix inches in length and two in breadth, and a quarter of an inch in thickneſs. The Colour thereof was livid, inclining to a Black.

The *Pancreas* was faſtened to the *Duodenum*, and extended towards the *Spleen*. It was an inch in breadth, and four in length.

The *Liver* had five great Lobes, and a ſixth leſſer than the reſt, ſituated in the middle of the lower part. *Bartholinus* reckons ſeven. The Liver of the Female was much paler than that of the Male, and it was marked with a great many ſpots of a darker Red.

The *Situation* of the *Kidneys* was ſuch, that the right was higher than the left. They were both faſtned to the Loins by a Membrane which we took for the Duplicature of the *Paritoneum*, which held them together as they are in Men, and in ſome other Animals. *Bartholinus* thinks that this Membrane is that which is particular to them, and which immediately invelopes their *Parenchyma*, but he confeſſes that it was more eaſily ſeparated than the proper Membrane uſed to be.

The *Penis* was ſituated between the two Pouches in a *Ductus*, as has been already declared. At its extremity it had a bone ſix lines long, one and a half broad at the narroweſt place, and above two towards its extremity, where it was larger, and divided; ſo that it had as it were two heads, between which there was a void ſpace like a Gutter, to give paſſage to the *Urethra*.

The *Matrix* was ſeparated into two long *Cornua*, at the end of which were the *Teſticles*, whoſe bigneſs ſcarce exceeded that of a great Pea, whoſe Figure they imitated, being almoſt round. Theſe *Cornua* produced likewiſe beyond the *Teſticles*, ſome Appendices of a fat and Membranous Subſtance, of an irregular Figure, which might be taken for the Fringes of the *Tuba* of the *Matrix*.

The *Lungs* had ſeven Lobes, three on one ſide, and three on the other, and and a leſſer than the reſt in the middle in the cavity of the *Mediaſtinum* near the *Diaphragme*. The Lungs of the Female was corrupted and filled with Stones.

The *Heart* was as in *Dogs*. The mouth of the *Aorta* was hardened; and as it were Cartilaginous: and there was a Fat which accompanied the *Vaſa Coronaria* even into the ſubſtance of the Heart.

The Muſcles of the *Temples* were very thick, and did cover as in the *Lion* the two upper ſides of the Head. In the *Os Frontis* there were ſix Cavities or *Sinus's* ſeparated from each other by Spongious and very thin Bones. The *Cerebrum* was divided from the *Cerebellum*, by a tranſverſe Bone, as in the generality of Brutes. *Bartholinus* has obſerved in a *Civet-Cat* a Bone which parted the *Cerebrum* in two, very different from this and all thoſe which are commonly found in Brutes in the inſide of the *Cranium*; for it lay long-ways according to the *Sutura Sagittalis*.

The *Glandula Pinealis* was very ſmall, and about the bigneſs of a little pins head.

The *Aqueous* humour of the *Eye* was muddied; which hapned as we thought, by the diſſolution of the Black, wherewith the reverſe of the *Iris* is beſmeared. The *Tapetum* ſtrongly inclined to White. Naturaliſts do ſay, that the Eyes of this Animal do ſhine in the night like thoſe of *Cats*. The *Cryſtalline* was more convex inward than outward; but that which it had moſt remarkable, was an extraordinary hardneſs, which put us in mind of what *Pliny* ſays of the Eyes of the *Hyæna*, viz. that there are thence taken ſome Precious Stones called *Hyæniæ*.

This Particularity joyned to a great many others, which are found common to the *Hyæna* of the Ancients, and to our *Civet-Cat*, made us rather to incline to the Opinion of *Belonius*, (who thought that theſe are not different Animals) than to that of *Scaliger*, *Ruellius*, *Alexander Benedictus*, *Matthiolus*, *Leo Africanus*, *Buſbequius*, *Aldrovandus*, and almoſt all the Modern Authors, who would have the *Civet-Cat* to be unknown to the Ancients, and that it was a Species of *Cat*: for according to our Remarks, the length of the Head and Eyes of the *Civet-Cat*, the ſmalneſs of the Teeth and Feet, the harſhneſs of its Hair, the ſoftneſs of its Tongue, the blackneſs and rectitude of its Nails, and the hoarſneſs which all Authors have obſerved in its Voice, which renders it more like to that of *Dogs* than *Cats*, are Characters wholly different from thoſe which are ſeen in all the Species of *Cats*. But on the contrary, all that the Ancients have related of their *Hyæna* is found in the *Civet-Cat*, ſome Incredible and Ridiculous things only excepted; as to make *Dogs* ſilent by its Shadow, as *Ariſtotle* and *Ælian* report; to know how to imitate the Voice of Men, whom it calls by their Name, to intice them from their Habitations, and devour them, as *Pliny* relates; and to have alſo Humane Feet, and no *Vertebræ* in the *Neck*, like the Animal which *Busbequius* takes for the *Hyæna* of the Ancients; which are Particularities, which *Leo Africanus* has not obſerved in the Animal which he propoſes for the *Hyæna*.

For the Deſcription of the Ancients, as to what concerns the exteriour Form, conſiſts in three things, which are to reſemble the *Wolf* by the Head, to have long ſtaring Hair on the Back, and a particular Aperture under the Tail, beſides the two which are commonly there in the Females of other Animals. The two firſt marks which we very diſtinctly diſcovered in our *Civet-Cat*, although, common to other Animals, have ſeemed to us very convincing, being joyned to the third, which is ſo particular, that it may be ſaid that there is not known any Animal wherein is found the like. For the Aperture which *Hares*, *Gazella*'s, and ſeveral other Animals have in this place, has nothing that reſembles the extraordinary Figure of this which is in the *Civet-Cat*, and which *Ariſtotle* has very diſtinctly obſerved in the *Hyæna* which he deſcribes, by ſaying, that this *Foramen* is like to the exteriour Orifice of the *Matrix* of a Woman.

The ſole difficulty which occurs is that the Ancients have not ſpoken of the Scent of the *Civet-Cat*: which has made *Gillius* to think, that it was the *Panther* of the Ancients, and *Caſtellus*, that it was an *Hyæna* of a particular Species. But it muſt be conſidered that moſt Natural Hiſtorians have compoſed their Works upon the Report of others, and that there is reaſon to doubt, whether the Hunters who informed them of the Particularities of Animals, were not too groſs and rude, as are the greateſt part of the Savages which are addicted to this Exerciſe, to be capable of knowing the goodneſs of the Scent of the *Civet-Cat*, and in this reſemble Beaſts that diſtinguiſh not the differences of Odours, but as they do relate to eating and drinking; ſeeing that we do know that the ſmell of *Civet* is very diſagreeable, and offenſive to ſeveral when it is new, and not mix'd with other Perfumes: but eſpecially Country perſons do not think that ſweet Odours are pleaſant, and do rather chuſe the ſmell of *Garlick* and *Pitch*, than that of *Incenſe* and *Benjamin*; whence it is, that the *Indians* do call the *Musk-Rat* the ſtinking *Rat*. And now in *Africa*, according to the report of *Gregorius a Bolivar*, the *Negro's* which do gather the Liquor which the *Civet-Cats* have left on Stones and Truncks of Trees, do not know it by the ſmell, but only by a thick and Oily tenacity, which makes them to ſcrape the places where they do find it, with a deſign to extract the Odorous Liquor, which ſwims upon the water wherein they boyl what they have ſcraped.

This incapacity of judging of good Odours, whereof we do ſuſpect the Hunters of the Ancients, do's otherwiſe appear very credible; becauſe that Authors have writ, that of all Animals the *Panther* only had a good ſmell: for it is not probable that theſe Hunters were of this Belief, only becauſe they never met with a *Civet-Cat*, *Martin*, *Gennet*, *Musk-Rat*, nor any of the Animals, which thoſe who have a ſubtiler and nicer ſmell do reckon to have a good ſcent; but that the reaſon of this was the defect of their ſmelling, which was not the Senſe they made uſe of to judge that *Panthers* had a good Odour, as *Ælian* avows, but only the thoughts that this muſt be ſo; this Opinion being founded only on the power which they ſaw that the *Panther* had of drawing Animals to it, which was ſuppoſed to be no other thing than a ſmell which was very pleaſing and agreeable to them.

The Explication of the Figure of the ELK.

THat which is remarkable in the lower Figure, is the length of the *Hair*, the greatneſs of the *Ears*, and ſhape of the *Eye*; the great *Canthus* or Corner of which is ſlit a great way, as alſo the *Mouth*, which is much wider than in the *Ox*, *Stagg*, and other Animals which have Cloven Feet.

In the Upper Figure.

A. *The firſt and largeſt* Ventricle.
B B. *A Membrane incloſing that* Ventricle, *and which might ſerve for an* Epiploon.
C C C. *Several* Bladders *filled with Wind, that were viſible in this Membrane.*
D. *The beginning of the ſecond* Ventricle.
E. *The beginning of the* Colon.
F. *The* Cæcum.
G. *The* Cone *of the* Heart.
I. *One of the* Hairs *cut croſſeways, ſeen with a Microſcope.*
K. *The root of that* Hair, *which is white and tranſparent,*
L L. *The whole* Hair *magnified, but not ſo much as the Piece.*
M. *One of the* Eyes.

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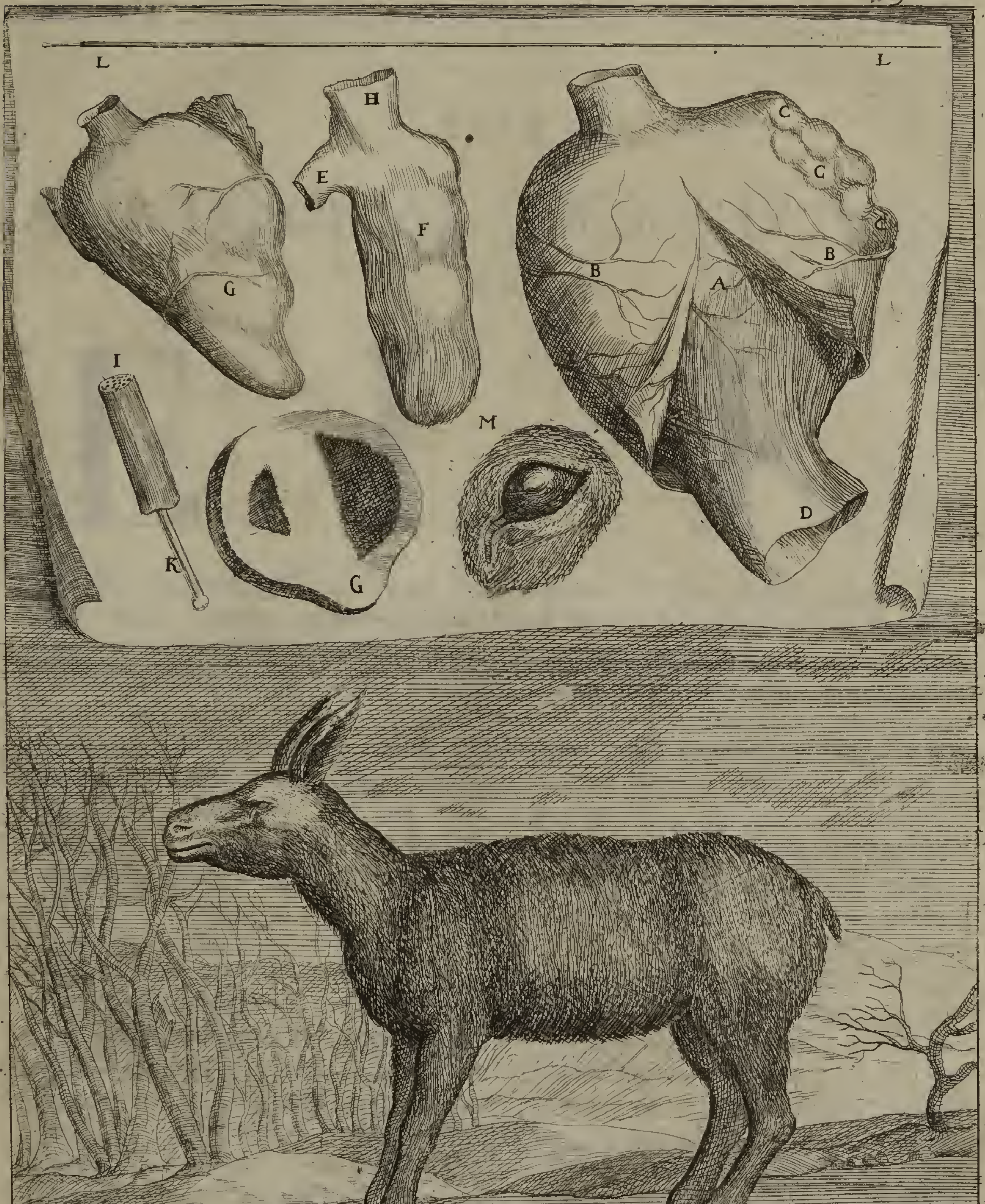

THE
ANATOMICAL DESCRIPTION
OF AN
ELK.

THis Animal, which is by all the Northern Writers called *Animal Magnum* ; by the *Germans*, *Elland*, and by the Modern Naturaliſts *Alces*, appeared to us at the firſt view not to be the *Alce*, which *Cæſar* mentions in his *Commentaries*, and which *Polybius*, *Solinus*, *Pauſanias*, and *Strabo*, have likewiſe deſcribed after him, becauſe that our *Elk* was not found wholly conformable to the Deſcription which theſe Authors do give of the *Alce*. Yet when we conſider, that they do not agree, and that the Deſcriptions which they do make of the *Alce*, are more different from one another, than that wherein they agree is different from our *Elk*; we thought that all theſe contrarieties, which are found only in ſome particulars ill explained, are not capable of hindring our Belief that our *Elk*, and all the *Alces* of the Antients are the ſame thing.

For the Reaſon of the diverſity of theſe Deſcriptions of the Antients is, that the *Elk* lives only in Countries where they had no Commerce. And *Pauſanias* reports, that amongſt all Animals, the *Alce* is the ſole one that is unknown to Men, becauſe that he ſuffers them not to approach him, by reaſon that he ſcents them at a great diſtance by the extraordinary ſubtilty of his ſmelling. But whether it be by this Reaſon, or by any other, it appears that Authors have very ill examined the *Alce*, which they have deſcribed. For ſome have reported, that it has Hair of different Colours, like the generality of *Goats*; others, that it is all of one Colour, like the *Camels*; ſome do make it Horned; others without Horns; ſome do ſay that it has no Joynts in the Leggs, and ſo being unable either to lye down, or riſe up, it ſleeps leaning againſt a Tree, which the Hunters do ſaw half through, to make the *Elk* to tumble down, and to catch him; others, that this is not true of the *Elk*, but of another Animal called *Machlis*. All theſe particulars, how contrary ſoever, are found in our *Elk*: which demonſtrates, that theſe Deſcriptions are not different, becauſe that they are of various Animals; but becauſe that thoſe which made them upon the report of others did not well underſtand what was told them. For it is true that our *Elk* had hair like a *Camel*, that is to ſay, all of one Colour over all the Body; and it is likewiſe held that the Hair of all *Elks* is of divers Colours, but it is at different Seaſons of the Year. Indeed our *Elk* which was diſſected in Winter had all the Hair of a Grayiſh Yellow, which is the Colour of the *Camel*; and the Northern Hiſtorians do ſay that it changes at Summer, at which time the Hair grows paler, as in *Deer*, whoſe Hair is paler in Summer than in Winter; and thus it is probable, that *Cæſar* has reported that the *Alce* or *Elk* has Hair of two Colours, upon the relation of thoſe which had ſeen it in Winter and Summer, and that this diverſity having been ill explain'd, he underſtood it of that which he had remarked in *Goats*, the generality of which have at the ſame time Hair of two Colours.

So when *Cæſar* ſays that the *Alce* has no Horns, and which *Pauſanias* attributes to it, they have both ſpoken true, becauſe that it may be that *Cæſar's* Hunters had mett only with Females, which have no Hornes; and that thoſe of *Pauſanias's* time had obſerved that the Males had Hornes.

As for what concern's the Leggs of the *Elk*, which are pretended to have no Joynts, altho ſome Authors report that there are *Elk's* in *Moſcovia*, whoſe Leggs are Joyntleſs, there is great probability that this opinion is founded on what is reported of theſe *Elks* of *Moſcovia*, as well as of *Cæſar's Alce*, and *Pliny's Machlis*, that they have Leggs ſo ſtiff and inflexible, that they doe run on *Ice* witout ſlipping; which is a way that is reported that they have to ſave themſelves from the *Wolves* which cannot purſue them; and likewiſe by reaſon of the ſtiffneſs of the blows which they do give with their Feet, which are ſo ſtrong, that when they do miſs the blow which they do level at ſome Beaſt, they do with their hind-feet break the Trees like *Muſhroom's*, as *Olaus Magnus* reports, and that with their fore-feet they have often run the Hunters through.

In fine, that which demonſtrates that from this diverſitie of Deſcriptions, which is only in reſpect of ſome particulars, it ought not to be concluded that the *Elk* and *Alce* are two different ſorts of Animals, is that the very Deſcriptions, which the Moderns do make of the *Elk*, do not agree together, and are not wholly conformable to what we have obſerved in our Subject. For ſome, as *Eraſmus*, *Stella*, and *Sigiſmundus*, do report that the *Elk* has a Solid Foot like a *Horſe's*, according to *Pliny*, who makes the *Alce* wholly to reſemble a *Horſ's*, except in the Neck and Ears, which are otherwiſe proportioned; *Menabenus* alſo, and *Joannes Cajus*, do give it a Beard like a *Goat*, and report that the reſt of its Hair is not longer than a *Horſe's*: which is not found in other Authors, nor in our *Elk*, whoſe Foot was Cloven, and altogether like that of an *Ox*. Its Hair was alſo in every part, not only a great deal longer than in *Horſes*, but it even proportionably ſurpaſſed that of *Goats* without any appearance of a Beard.

We found not that piece of Fleſh which *Polybius* reports, after *Strabo*, to be under the Chin of the *Alce*, nor the hairs which ſome do make on its Neck, and which *Geſner* averrs to have ſeen in a figure of an *Alce*, which was ſent to him by *Sebaſtian Munſter*; but theſe two particularities being ſingular to each of theſe Authors, and no Perſon haveing ſpoken thereof ſave them, they ought not to prejudice the common opinion, which makes no difference between the *Alce* and the *Elk*.

But that which more confirms this Opinion, is that all the particulars on which the Antients do agree, are found in our *Elk*; for they do all conſent, that the *Alce* is an Animal near upon the Stature of the *Stagg*, which it likewiſe reſembles by the greatneſs of the Ears, and littleneſs of the Tail, as alſo by the Horns, which are not found in female *Elks*, nor in *Hindes*. They do alſo agree in this, that the *Alce* differs from the *Stag* in the length and colour of its Hair, in the greatneſs of its upper Lip, in the ſmallneſs of its Neck, and ſtiffneſs of its Legs.

Our *Elk* exceeded five Foot and a half from the end of the Noſe to the begining of the Tail, which contained but two Inches in length. It had no Horns, becauſe it was a Female; and the Neck was ſhort, being as broad as long, which was Nine Inches; the Ears were Nine Inches in length and four in breadth; and there is reaſon to admire, why thoſe who have thought the *Alce* of the Authors of late Times, which they do take for our *Elk*, was the *Onager*, or wild *Aſs* of the Antients, are not grounded upon the reſemblance of the Ears, which in their bigneſs do far ſurpaſs thoſe of *Staggs*, *Cows*, and *Goats*, and which have none comparable, ſave thoſe of *Aſſes*, which our *Elk* did better reſemble by theſe Parts, than by the Hair, or Feet; although *Scaliger* affirms, that the Feet of the *Elk* are like to thoſe of an *Aſs*; and *Stella* and *Sigiſmundus* report,that there are ſome *Elks* whoſe Feet are ſolid; but there is ground to believe, if this is true, that it is a thing as ſingular to ſome *Elks*; as it is extraordinary to *Horſes* to have a cloven Foot, and to *Hoggs* to have it ſolid,as *Pliny* reports,that theſe Animals have in certain Countrys.

As to the *Hair*, the colour of our *Elks* differed very little from that of the *Aſſe*, the Gray of which ſometimes approaches that of the *Camel*, to which we have in this already compared our *Elk*; but this Hair was in ſome places very different from that of the *Aſs*, which is a great deal ſhorter, and from that of the *Camel* which is a great deal finer. This Hair was three Inches long; and its bigneſs equalled that of the courſeſt *Horſe* Hair. This bigneſs grew leſſer toward the extremity which was pointed; and towards the root it was alſo ſtaitened, but all at once, making as it were the handle of a *Lance*. This handle was of another Colour than the reſt of the Hair, being diaphanous like the Briſtles of a Hog. This tranſparent Part had at the extremity a little head or rotundity, which was the root; and it ſeems that this Part, which was finer and more flexible than the reſt of the Hair, was ſo made, to the end that the Hair which was elſewhere very hard, might keep cloſe, and not ſtand an end. This Hair cut through the middle, appeared in the *Microſcope* ſpongy on the inſide like a ruſh; which *Geſner* explains very ill, when he only ſays, that it is hollow. This Hair was long as a *Bears*, but ſtraiter and cloſer, and all of one ſort.

The upper *Lip* was great, and looſed from the Gums, but not ſo great as *Pliny* makes it in the *Alce*, when he ſays, that this Beaſt is forc'd to feed backward, to prevent his Lip from getting between his Teeth. And in the Diſſection we obſerved, that Nature has otherwiſe provided againſt this inconveniency, by the means of two great and ſtrong Muſcles, which are particularly deſigned for the raiſing this upper Lip.

We likewiſe found the Articulations of the *Legs* ſtrongly knit together by hard and thick Ligaments. Nevertheleſs it is true, that if one could believe what is reported of the *Elk*, that being very ſubject to the *Epilepſie*, when it is fallen into a Fit of the Diſtemper, it is Freed and Cured, by lifting one of his Feet unto his *Ear*, and that the Hoof of this Foot is an infallible Remedy for the *Epilepſie*. This Animal muſt have joynts far more ſupple than thoſe of the *Alce* have appeared to them that thought it had none, and which we have not found in our *Elk*, or at leaſt it is neceſſary that the *Convulſions* wherewith it is agitated being in this Condition, do make ſome very ſtrange Efforts on the Ligaments of the joynts, to extend them ſo far beyond what they ordinarily are. But if *Olaus Magnus* has writ like an Hiſtorian, and if it be not in Raillery that he ſays that of the two *Claws* which are at the end of each of the *Elk's* Feet, that alone which is on the outſide of the right Foot, is proper to cure the *Epilepſie*, there muſt be ſuppoſed a much more admirable Diſlocation ; and it may be ſaid that the Cure of this Diſtemper, by the ſingle touch of the *Elk*'s Claw, when a Ring of it is worn, is not more ſtrange, nor incredible than the Contorſion that muſt be conceived in this Foot, to make the Claw, (which is on the outſide) to be put into the *Ear* : So that to underſtand what *Olaus* means, it is probable that his intention was to deride the imaginary Vertue of the *Elk*'s Foot, and that he has very prudently made uſe thereof. For being unwilling openly to declare his Opinion, which was contrary to that of the Vulgar, who love Specificks, amongſt which the Claw of the *Elk*'s Foot is the moſt Celebrated ; and ſeeing that they do not ſo much eſteem the Phyſitians who do make Profeſſion of uſing Remedies, as Inſtruments proper to worke ſome Cures, as thoſe who do boaſt of Caſting them, if I may ſo ſay, in a Mould, by *Febrifuges, Antipleureticks, Antipodagricks*, and *Antepilepticks* ; This great Man explains himſelf by a Figure, which leaves thoſe who would be deceived in their Error, without ſcandalizing them, and which makes others to underſtand his meaning. For the Proverb being that the *Eye* muſt be rubbed only with the *Elbow* when it is ſore, to ſignifie that it muſt not be touched at all ; he has intimated that there is no Claw of the *Elk* which infallibly cures the *Epilepſie*, by ſaying that there is none but that on the outſide of the Foot which the *Elk* can put into its *Ear*, that can do it : for he adds this impoſſible qualification to a great many others which Authors do mention, and which are very difficult, but abſolutely neceſſary, as it is ſaid, to make this Remedy Operate: as to have been cut off with one blow of an Hatchet, the Animal being alive, on St. *Giles*'s day, from a Male which is at Rut, and has not yet engendred ; to manifeſt that the Impoſtors which would ſell *Elks* Claws, have added all theſe difficult qualifications, to the end that thoſe who have experienced the Claw of the *Elk*, which they made uſe of, to ſignifie nothing, may think that it is the want of ſome one of thoſe Qualifications, which is certainly in that which the Merchant preſents them.

Having made theſe Reflections on the firmneſs of the Ligaments of the Joynts of the *Elk*, we obſerved the Figure of the *Eye*, the great *Canthus* or Corner of which was ſlit downwards, a great deal more then it is in *Stags*, *Fallow-Deer*, and wild *Goats*, but after a faſhion very extraordinary, which is, that this ſlit was not according to the length of the *Eye*, but made an Angle with the line which goes from one of the corners of the Eye to the other. The Diſſection diſcovered to us that this ſlit was proportioned to the *Glandula Lachrymalis*, which was found to contain an inch and a half in length and ſeven lines in breadth.

The internal parts had ſomething reſembling thoſe of an *Ox*, eſpecially in that which concerns the four *Ventricles* and *Inteſtines*. Nevertheleſs theſe Parts had this particular, that the firſt and greateſt *Ventricle* was partly incloſed by a Membrane like a Sack, which having abundance of Veſſels might paſs for the *Epiploon*; and that inſtead of the Glands and Fat, which is uſually in this part, there was only towards the top ſome Bladders full of wind about the bigneſs of a *Cheſnut*. The *Inteſtines*, which were forty eight foot long, had a *Cæcum* without an Appendix, which was thirteen inches long, and five broad. It nearly reſembled the Figure of a Man's.

The *Liver* was ſmall, not exceeding one foot in length and ſeven inches in breadth. It was whole, without Lobes, and even without any appearance of the cleft which is over the *Cartilago Xiphoides*. It was ſo joyned to the *Diaphragme*, that it was impoſſible to ſeparate it from its convex part without cutting it. It had no *Gall-Bladder*, and it was all over, and even to the bottom of its *Parenchyma*, of a gray and livid Colour.

The *Spleen* was likewiſe very ſmall, being no more than eight inches long and ſix broad. The Subſtance of theſe two *Viſcera* ſeemed very ſmooth and Homogeneous: but the *Kidneys* were in their external Subſtance ſpotted with two different Colours, which made it to appear rough like *Chagrin*, tho to the touch nothing felt rugged. They were not adherent to the *Loyns* by the Duplicature of the *Peritoneum*, but faſtned only by their Veſſels.

The *Lungs* were divided into ſeven Lobes, of which there was three on each ſide, and one at the middle in the Cavity of the *Mediaſtinum*. The inferiour Lobes were each as big again as the ſuperiour.

The *Heart* was ſeven inches long, and five broad. Its Figure was pointed, and from the *baſis* to the point there was an Eminence obliquely turned like a Screw, which Eminence anſwered to the Separation of the two *Ventricles*, ſo that it ſeemed to be a fold of the external part of the right *Ventricle* upon the left. This Eminence, which is ſcarcely viſible in the *Heart* of other Animals, was extraordinarily apparent in this. The *Septum* and reſt of the *Parenchyma* of the *Heart*, which environed the left *Ventricle*, had the thickneſs of an inch. The Rings of the *Aſpera Arteria* were imperfect.

The *Brain*, comprehending the *Cerebellum*, was but four inches in length, and two and a half in breadth. The ſmallneſs of this part compared with the greatneſs of the *Glandula Lacrymalis*, (which, as has been ſaid, was an inch long,) ſeemed to us as an Argument capable of confirming the Opinion of thoſe who believe that the greateſt part of the Glands which are about the *Brain* do not receive from it the *Humidities*, wherewith they uſually are imbued; but that they are brought to them by the Arteries, or by the Nerves, from which they do receive the Matter, whereof they do make the *Lympha*. The Curioſity which we had of exactly ſeeking out the *Ductus*'s deſigned to receive and convey theſe Humours, which muſt be very viſible in a part ſo extraordinary large, could not be ſatisfied, by reaſon of the corruption of our Subject, which had been kept ſo long, that all the Parts began to diſſolve with Putrifaction.

The *Subſtance* of the *Brain* differed not from that of the *Cerebellum*, both being very white, and firm enough, notwithſtanding the Corruption, to make it appear very ſound, in an Animal ſo ſubject to ſome Diſtempers, whoſe ſeat is placed in the *Brain*: which according to *Cardan*, is colder, moiſter, and more Phlegmatick in this Animal than in any other.

The *Glandula Pinealis* was of an extraordinary ſize, exceeding three lines in length, like that which we found in the *Dromedary*; but its Figure was Conical as uſually, whereas the *Glandula* of the *Dromedary* had the form of a *Trefoile*. This greatneſs, which to us ſeemed very conſiderable, in regard of the ſmalneſs of the reſt of the Brain, made us to think that thoſe who, following *Eraſiſtratus*, do attribute to the different Formation of the Organs of the Brain the divers Operations of the interiour Senſes, might fortifie themſelves in their Opinion by ſome ſuch like Obſervations; conſidering that *Lions*, *Bears*, and other fierce and cruel Beaſts, have this part ſo little, that it is almoſt imperceptible; and that it is very great in thoſe which are timerous like the *Elk*, which is held to be ſo fearful, that it dies with fear, when it has received the leaſt wound: and it is obſervable that he never recovers when he ſees the ſmalleſt drop of his own Blood.

In the *Brain* we likewiſe found another part, whoſe bigneſs had relation to the ſmelling, which is more exquiſite in the *Elk* than in any other Animal, according to the Teſtimony of *Pauſanias*, as has been already declared: For the *Proceſſus Mammillares*, which are thought to be the Organs of that Senſe, were without compariſon greater than in any Animal that we have Diſſected, being above four lines in Diameter.

The

The Explication of the Figure of the Coati Mondi.

THe lower Figure repreſents the different Colours of its Hair, which is lighter under the Belly, and Stomach, than on the Back, and Paws. It is alſo neceſſary to be advertized, that the Snout is ſomewhat more crooked than it was when the Diſſection was made, deſignedly to expreſs the mobility which was there obſerved, and the great facility which it had to be raiſed upwards. The Tail is bent downwards, becauſe it was found thus diſpoſed in the dead Animal. Yet Authors do ſay that the *Coati* uſes to carry his Tail very erect.

In the Upper Figure.

A. *The* Dens Caninus, *in form of a* Tusk.
B B. *The* Tongue.
C C. *The* Os Penis.
D. *The right* hind-foot.
E. *The* Spurs *of the* Heel. *All as big as the* Life.

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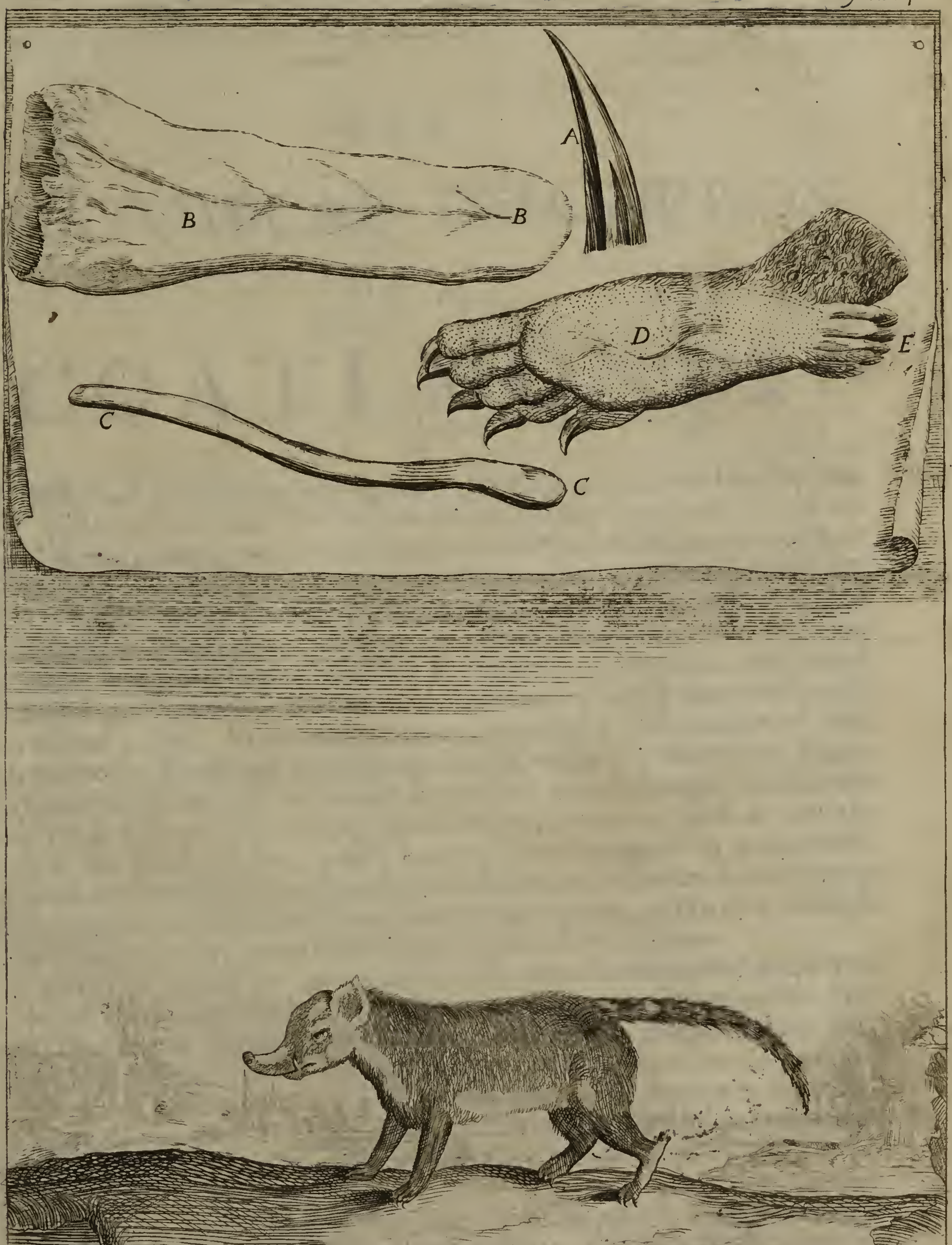

THE ANATOMICAL DESCRIPTION OF A COATI MONDI.

THE *Coati* is an Animal of *Brazile*, which is varioufly deſcribed by Naturaliſts; and their Deſcriptions do not exactly agree with what we have obſerved in ours: which may cauſe a belief that there are ſeveral Species of them. *Deleri* in his Voyage of *Brazile* gives it a *Snout* a Foot long, round as a ſtick, and as ſmall at the beginning as towards the end, very like the *Proboſcis* or Trunk of an *Elephant*, to which *Margravius* alſo compares this *Snout*: but in his Figure he makes it like that of our *Coati*, which had nothing of an *Elephant*'s Trunck but its mobility, which is ſcarce otherwiſe than that of a *Hog*. In the Kings Library, amongſt a vaſt number of Animals painted in Miniature with a great deal of exactneſs, there is the Figure of a *Coati* which ſome of the Society ſaw alive; which though it reſembles ours, yet is different in ſome very conſiderable particulars, ſuch as are the ſhape of the *Teeth* and *Feet*, which were very extraordinary in our Subject: but notwithſtanding it is found to have ſufficient reſemblance to the Figure which *Margravius*, *Laet*, and *Deleri* have given thereof, and to that which is in the Kings Library, to make it thought to be a kind of *Coati*.

It was in all thirty five inches and a half; *viz.* ſix inches and a half from the end of the *Snout* to the hinder part of the *Head*, and ſixteen inches from the *Occiput* to the beginning of the *Tail*, which was thirteen inches long. From the top of the *Back* to the extremity of the *fore-Feet* was ten inches; and there was twelve to the end of the *hind-feet*. Its *Snout* was very long, and movable like that of a *Hog*; but it was ſtraiter and longer in proportion. Its motion was more evident than in the *Hog*, its *Snout* eaſily turning upwards.

The four *Paws* had each five *Toes*, the Claws of which were black, long, crooked, and hollow like thoſe of the *Caſtor*. The *Toes* of the *fore-Paws* were a little longer than thoſe of the *hind-Paws*, which were like to thoſe of the *Bear*, excepting that the whole ſole was without *Hair*, wherewith the Heel

of

of the *Bear* is covered. The Palms and Soles of theſe four Paws were covered with a ſoft and tender skin as in the *Ape*; and this ſoftneſs of skin was the only thing which our Subject had of the *Ape*, to which we found it had no other reſemblance, although it was given us for a *Sagoin*, which is a kind of *Monky*: for its Tail, whoſe length in ſome ſort reſembled the Tail of the *Apes*, which are called *Cercopitheci*, was different therefrom in the length of the Hair, which is a great deal ſhorter in the Tail of *Apes* proportionably to their Body. The ſole of the *hinder-paws* was long, having a Heel, at the extremity of which there were ſeveral Scales a line broad, and five or ſix long. They grew out behind, heaped together like a *Marigold*, when it cloſes it ſelf at Night.

The *Hair* was ſhort, rough and knotty. It was blackiſh on the Back, in ſome places of the *Head*, and at the end of the *Paws* and *Snout*. As for the reſt of the Body it was mix'd with Black and Red, yet ſo that the bottom of the Belly and Throat was of a deeper Red in ſome places than in others. The Tail was covered with a Hair of theſe two Colours, which formed ſeveral Circles, or Knots, the one Black, and the other mix'd with Black and Red.

The *Tongue* was chop'd with ſeveral Fiſſures or Strokes, which made it to reſemble the top of a leaf of a Tree.

The *Eyes* were very ſmall, like a *Pigs*. The *Ears* were round like thoſe of *Rats*; and covered at the top with a very ſhort hair, but in the inſide with a longer, and whiter.

There were ſix *Inciſores* in each Jaw. The *Canini* were very large, eſpecially thoſe of the lower Jaw. Their Figure had ſomething more particular, not being round, blunt, and white as in a *Dog*, *Wolf*, or *Lion*, but ſharp by the means of three Angles, which at the extremity formed a point ſharp like an Aule. They were grayiſh, and ſomewhat tranſparent. The *Gula* was large, and cleft as a *Hogs*; and the lower Jaw was alſo as in a *Hog*, very much ſhorter than the upper.

Now there was not found any of theſe particulars in the *Sagoin*; and theſe two Animals having nothing common ſave the Country wherein they do breed, which is *Brazile*, we have found no Deſcription in the Authors which have treated of the particular Animals of *America Meridionalis*, which ſuites better to what we have obſerved in our Subject, than that of the Animal which *Margravius* and *Laet* in their *Brazilian* Hiſtory do call *Coati*, which is a *Genus* whereof they do make two *Species*; the one has Red Hair all over the Body, and is ſimply called *Coati*; the other has only the Belly and Stomach of this Colour, which they do call *Coati Mondi*.

In the Deſcription which theſe Authors do make of this Animal, the marks which we have there deſcribed, and which we have met with in our Subject, do all occurr except the Teeth and Scales, which are at its Heels, which they have not mentioned, and the Tail, which in their *Coati*'s they do make much longer than the reſt of the Body. But *Laet* reports that theſe Animals uſed to bite off their Tail, and that they do live on it ſome time, which at laſt they do wholly devour, and then die. It might be that ours ſo ſhortned his. They do likewiſe ſay that the *Coati's* have hands made like thoſe of *Monkies*: which appeared not in our Subject, whoſe feet were otherwiſe very like to the Figure which *Margravius* has inſerted in his Book.

By the Diſſection we found, that under the Skin, and between the Muſcles there was a great deal of Fat, white and hard like Tallow. The *Penis* was hid in a paſſage an inch deep, and as much broad, whoſe Aperture was under the Belly, about four Fingers diſtant from the *Anus*. This *Penis* was provided with a Bone, whoſe length did in proportion exceedingly ſurpaſs that of the Bones which are found in the *Penis* of other Animals which have it. It was thick at both ends, and had a Figure reſembling the Bone of a *Pullets* Thigh. Along the *Penis* there were two *Veins* very large, and full of Blood, which went to the *Balanus*. The *Teſticles* were like to thoſe of *Dogs*.

The *Epiploon* was very ſmall. It had little Fat, and was a complication of Fibres and Fillets rather than a Membrane. It was not laid upon the *Inteſtines*, but tucked upon the *Ventricle*.

The *Spleen* was two inches and a half long. It was of a Dark-red at the ſide of the Stomach in its hollow part, and Blackiſh at the extremity in its gibbous part. There was not obſerved any Veſſels in the external Membrane of the *Ventricle*, except the *Coronaria Stomachica*, which appeared towards the upper Orifice, and ſoon diſappeared, ſhooting forth a few Branches.

The *Liver* was ſomewhat blackiſh, and of a Subſtance very Homogeneous, without any appearance of Glands. It had ſeven Lobes, two great ones on the left ſide, and five other ſmall ones on the right ſide. The *Bladder* was between the two upper Lobes.

The *Pancreas*, which was faſtned along the *Duodenum*, inclining more towards the right *Kidney* than towards the *Spleen*, was very ſmall. The *Meſentery* was all filled with a very hard Fat, which incloſed, and almoſt concealed all its Veſſels.

The *Inteſtines* contained in all ſeven foot in length. They were all of one thickneſs, and had nothing which might diſtinguiſh them from each other; there was no *Cæcum*.

The right *Kidney* was a great deal higher than the left, ſo that two Lobes of the *Liver* covered it.

The *Lungs* had five Lobes; two on the right ſide, and two on the left, which were ſomewhat ſmaller; and a fifth in the *Mediaſtinum*.

The *Heart*, which reſembled that of a *Dog*, had the right *Auricle* extremely great. In the right *Ventricle*, and in the right *Auricle*, there was found a great deal of ſlimie matter, hardened.

The *Muſculus Crotophites*, paſſing under the *Zygoma*, was faſtned there. It was extraordinary fleſhie, even to its inſertion, which is made by a very large tendon, which was incloſed between two pieces of Fleſh, much thicker than thoſe which are generally found in this place, and which are thought to be there put to defend and ſtrengthen the tendon of the Muſcle of the *Temples*.

The *Orbita* was not Bony throughout, but it was ſupplied in the upper part, by a Crrtilaginous Ligament, which joyned the *Apophyſis* of the *Os Frontis* to that of the firſt Bone in the upper Jaw.

The *Bone* which ſeparates the *Cerebrum* from the *Cerebellum*, was as in *Dogs*. The *Dura Mater* was very adherent to the *Cranium*. The *Sinus*'s of the *Os Frontis* were full of a matter like a fryable Fat. The *Mamillares Proceſſus* were very large.

The *Globe* of the *Eye* exceeded not four lines and a half in Diameter. The Aperture of the *Eye-lids* was larger, and the *Pupilla* it ſelf was not leſſer than the whole Globe of the Eye. The *Cryſtalline* contained three lines in breadth, and two and a half in thickneſs, and was more convex inwards than outwards. This thickneſs of the *Cryſtalline* made the two other Humours to be leſs in quantity. The *Choroides* was all over of the ſame colour, *viz.* of a very brown-red, without any *Tapetum,* which is hardly ever wanting in the Eyes of other Animals.

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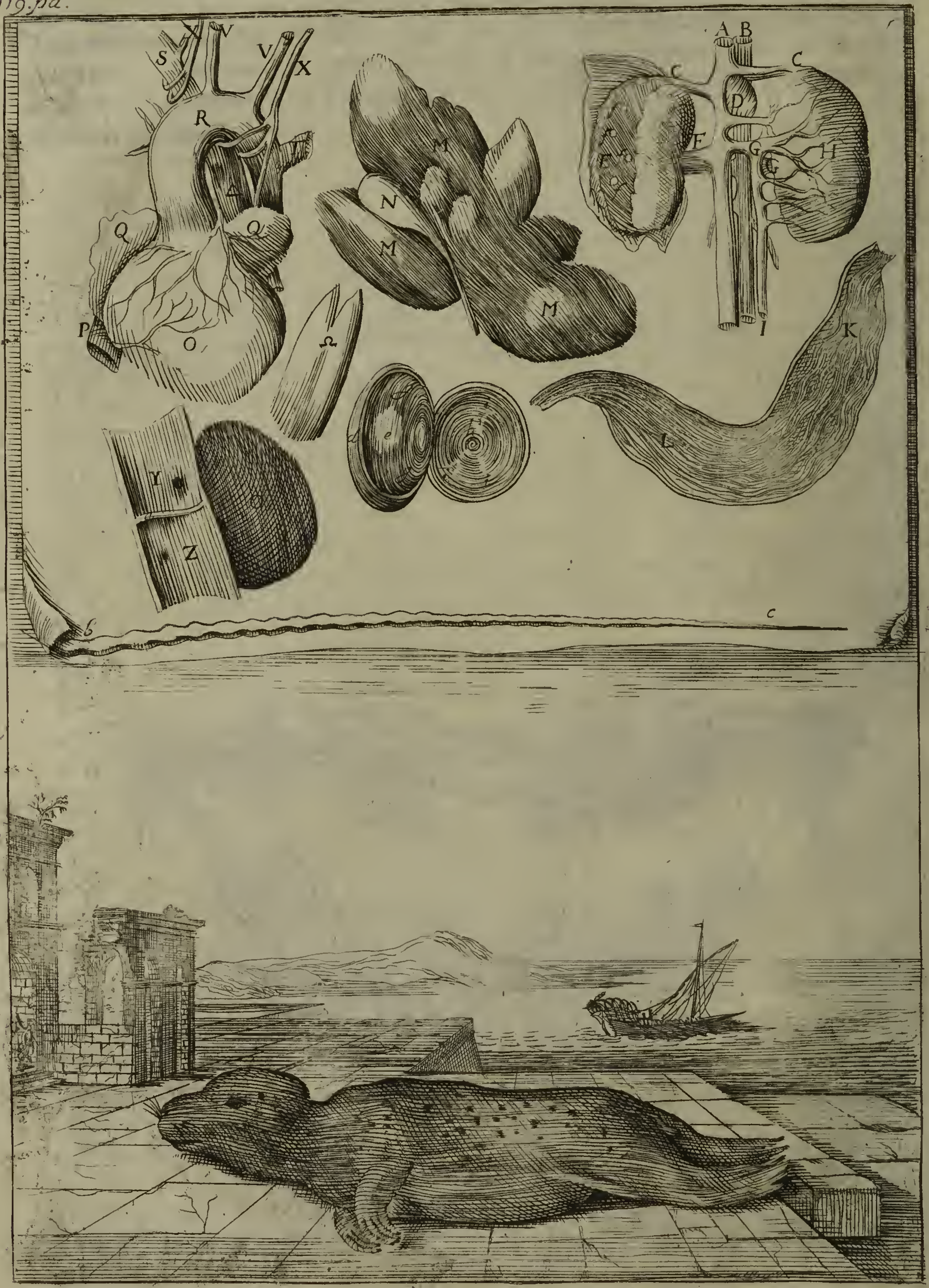

The Explication of the Figure of the SEA-CALF.

THE lower Figure ſhews the difference that there is between the *Fore-feet*, which are locked up under the skin except the *Paws*, and *hind feet*, which are joyned together, having the form of a Fiſhes Tail. It may be likewiſe obſerved that the *Ears* do ſeem to have been cut off, having no external *Ears*.

In the Upper Figure.

A. *The* Trunck *of the* Vena Cava.
B. *The* Trunck *of the* Aorta.
C C. *The* Venæ *and* Arteriæ Adipoſæ.
D. Ren Succenturiatus.
E. *The right* Kidney *ſtrip'd of the* Membrana Adipoſa, *and divided by the Gibbous part.*
f f f f. *Four ſmall particular* Pelves.
F. *The* Emulgent Veſſels *of the right* Kidney.
G G. *The* Emulgent Veſſels *of the left* Kidney.
H. *The left* Kidney *covered with its* Membrana Adipoſa.
G I. *The left* Spermatick Vein *which generally enters into the* Emulgent, *but which has three other Branches which do faſten it to the* Membrana Adipoſa.
K L. *The* Ventricle, *half of which is taken away to repreſent the Structure of the Internal Membrane, whoſe wrinckles are undulated and waved in the upper part, and ſtrait in the Lower.*
M M M. *The* Liver. N. *The* Gall-Bladder.
O O. *The* Heart.
P. *The* Vena Cava, *which runs along by the* Baſis *of the* Heart.
Q Q. *The* Auricles *of the* Heart.
R. *The* Aorta *making the Croſs.*
S. *The right* Arteria Axillaris.
T. *The left* Axillaris.
Δ. *The Artery of the* Lungs.
V V. *The* Carotides.
X X. *The* Nervi Recurrentes.
Y Z. *The* Vena Cava *opened at the place where it is faſtned to the* Heart.
Y. *The hole which penetrates into the right* Ventricle.
Z. *The Oval hole which penetrates into the Vein of the* Lungs.
a. *An edge made by the Interiour Membrane of the* Vena Cava.
b c. *One of the Hairs of the Beard repreſented twice as big as the Life.*
d. *Part of the* Sclerotica, *which with the* Cornea *not repreſented makes the half of the Eye cut in two.*
e. *The* Cryſtalline.
g g. *The Vitreous Humour.*
h i i i. *The other half of the Eye.*
h. *The Extremity of the Optick Nerve, which enters directly at the* Axis *of the Eye.*
i i i. *Three Branches of Blood-Veſſels which do enter into the Eye with the Optick Nerve, and which are ramified in the* Retina.
Ω. *The* Tongue.

THE

ANATOMICAL DESCRIPTION

OF A

SEA-CALF.

RONDELETIUS has obſerv'd that the *Sea-Calfe* is of two Species; one of which is found in the *Mediterranean*, and the other in the Ocean. But he makes no other difference between each of theſe two Species than the habit of the Body, which he reports to be fuller in the *Sea-Calfe* of the Ocean than in that of the *Mediterranean*, which is not ſo thick and ſhort as the other. The *Sea-Calfe* whoſe deſcription we make had more reſemblance with this ſecond Species than with the firſt.

It had a long Neck and the Head farther diſtant from the Shoulders than it is in the *Calfe* of the Ocean, ſo as it is repreſented in the figures we have of it ; and the reſt of the Body was likewiſe ſtraiter. The Breaſt was broad by reaſon of the ſituation of the *Omoplata*, which were forwarder than they are in other Animals, which have the Breaſt Pointed and narrow when the *Omoplata* are backwarder. The whole Animal was twenty eight Inches in length from the Noſe to the end of the hind-Feet, which according to the diſpoſition that they Naturally have in this Animal, were extended and joyned one to the other ; having in this only the forme of a *Fiſh*'s Tail, according to the Deſcription of *Ariſtotle*, which is contrary to that of *Rondeletius*, who repreſents the *Sea-Calf*, as well that of the Ocean as of the *Mediterranean*, without hind-feet, and who reprehends *Ariſtotle* for reporting that this Animal has Toes on the hind-feet like to thoſe of the fore-feet; ſo that it ſeems that *Rondeletius* has confounded the true *Sea-Calfe* or *Phoca* of the Ancients, with the *Sea-Ox* of the *Weſt-Indies* which has no hind-feet, but only a miſhapen *Fiſh*-Tail, which it makes uſe of for Swiming, which it performes with a very great Swiftneſs, according to *Cluſius*, who ſays that he ſaw one which the *Hollanders* had brought from the *Indies*.

The *Sea-Calfe* which we deſcribe had not only two hind-feet, but beſides that a Tail of an Inch and a half long, which *Ariſtotle* juſtly compares to the Tail of a *Stagg*. 'Tis true that the Toes of theſe feet were not ſo ſhaped nor ſo diſtinct as in the fore feet, and that theſe two feet thus extended as they were, and joyned one againſt the other had rather the Forme of a *Fiſhe's* Tail, than that of the feet of Animals which have any, and which they commonly bend under the Belly. Theſe feet were like to thoſe of a *Ducker*, which cannot walk like other *Birds*, by holding their Body parallel to the ground,but which are forc't to go upright like man.

Ariſtotle ſays that the feet of the *Sea-Calfe* reſemble Hands: his meaning is that the fore-feet of this Animal, in ſtead of the three parts which do compoſe the Arme of a Man, *viz.* the Arme, *Cubitus*, and Hand, have only the laſt correſpondent to the hand of Man, ſo that this Part proceeds immediately from the Breaſt. The *Sea Ox* of the *Weſtern* Iſlands, which is a kind of *Sea-Calf* of a prodigious bigneſs, is there called *Manaty*; becauſe that according to *Oviedo's* remarks, it has only the fore-feet, which by the *Spaniards* are in all Animals commonly called Hands. In our Subject the *Brachium* and *Cubitus* were incloſed and lockt up under the Skin which covered the Breaſt; and there was only the Paws which came outwards. Theſe Paws thus cloſed and contracted did not ſeem to us ſufficient to ſerve the Female to imbrace her Young, as *Oppian* reports that ſhe do's,when ſhe carry's them to Sea: They did likewiſe appear,even as the hind-feet, fitter for ſwiming than walking; altho' in truth, neither the one nor the other of theſe feet could well ſerve to walk conveniently. *Ælian* has obſerved, that the Females have a great care of carrying and frequently recarrying their Young Ones, ſometimes into the Sea, and ſometimes on Land; it is probable, that this is to teach them to Swim, and walk, by a long Exerciſe, which produces a habit capable of ſupplying the conveniences which Nature has denyed them. 'Tis likely that *Homer* calls the *Sea-Calves Nepodes*, by reaſon it may be ſaid, that they do Swim with Feet, and walk with Fins, and not becauſe they have no Feet, as *Euſtathius* explains it. Theſe Feet had Claws which were not ſo neceſſary for ſwiming as they are for walking. So that it ſeems, that Nature, who has made the *Sea-Calf* to live like the *Caſtor*, on Land and in the Water, has given Organs to each of theſe Animals to go with more or leſs eaſe, according as it has deſigned them to be more generally in the one or other of theſe Elements; for the *Sea-Calf*, which is oftner in the Sea, than on Land, walks not with ſo much eaſe and facility as the *Caſtor*; and the *Caſtor* Swims not ſo eaſily as the *Sea-Calf*, becauſe it goes into the Water only to catch *Fiſh*, and makes not its common reſidence there.

For theſe very Reaſons, the *Heart* and *Lungs* of the *Sea-Calf* have a particular conformation, to inable this Animal to continue a long time under Water without breathing, as ſhall hereafter be explained; but the *Caſtor* which ſtays not long in the Water, has not this particular formation of the Heart; at leaſt we have not found it in the two *Caſtors* which we diſſected, the one whereof was of *Canada*, the other of *France*.

The Head was not ſhort and round, as *Rondeletius* deſcribes it, and its Noſe was long enough to make it reſemble the Head of a *Calf*. But the Eyes were not like thoſe of a *Calf*, which has them full, and as it were ſtanding out of the Head; for thoſe of our Subject were hid, and as it were ſunk into their *Orbites*,whoſe upper Edge was not raiſed, as it is in the *Calf*.Nevertheleſs theſe Eyes were large, containing fifteen Lines Diameter. There was an internal Eye-lidd to cover the Eye; it was drawn up and hid in the great *Canthus*.

Over the Eyes there wanted thoſe long Hairs which *Rondeletius* and *Severinus* do there place, and it only had ſome at the ſides of the Noſe, which were of a very peculiar Figure, being ſquare and flatted with knots from ſpace to ſpace, and very cloſe to one another, as it is repreſented in the Figure.

Beyond the Eyes there were holes for the internal Ears as in Birds, and there were no external ones. *Ariſtotle* has obſerved that this is peculiar to the *Sea-Calf*, which among all viviparous Animals, is the ſole one that has internal, and no external Ears.

The whole skin was covered with a ſhort Hair, very like to that of the Land-*Calf*. *Silvaticus* dos ill compare it to that of the *Goat* which is very long. Its Colour was between a Gray and Yellow, ſomewhat fainter towards the Belly than towards the Back, which was chequered with Spots, about the bigneſs of ones Nail, of a dark-red. *Pliny* reports that this Hair, a long time after that the Skin has been flead, retains ſuch a ſimpathy with the Sea, that it follows its motions, and that ſometimes it ſtares, ſometimes is ſmooth, as the Sea ſwells or is abated by its flux and reflux. *Severinus* declares that he had ſeen this Miracle; but he expreſſes it with ſuch exceſs, that it is the leſs credible. He ſays, that when the North-wind blows, the Hairs which were raiſed by the South-wind are not only laid, but do wholly diſappear. *Cardan* affirms that this Property, which had paſſed for Fabulous, was found true in the *Indies*. Experience has demonſtrated to us that this Miracle is never ſeen at *Paris*. For having kept and obſerved this Skin for ſeveral Months, we found that the Hair was in all weathers of the ſame highth and ſituation.

The Skin was hard and thick. *Pliny* ſays that it is impoſſible to kill the *Sea-Calf* but by breaking its Head. The Hiſtorians of the *Weſt-Indies* do report that the Skin of the *Manati* being Tanned is above an inch thick, and that thereof is made the Soles of Shooes.

The *Teeth* which were long and ſharp in both the Jaws, were very unlike to thoſe of the *Calf*, and do better reſemble the Teeth of a *Wolf*. So that the *Spaniards* and *Germans* have reaſon to call this Animal the Sea-*Wolf*. Beſides, the mild and heavie diſpoſition of the *Land-Calf* has very little reſemblance with that of the *Sea-Calf*, which Naturaliſts report to be Crafty, Bold, and Couragious, living on Rapine, having the Induſtry of Aſſembling with its Kind, to attack the greateſt Fiſhes, and ſtrength enough to defend it ſelf on Land againſt the *Bear*: which is hardly credible of the *Calves* of the Stature of ours, and can agree only with thoſe which are taken near *England*, which according to *Geſner* are as great as the *Bears*; or rather with thoſe whereof *Gomara Oviedo*, *Pedro Cieſa*, and the laſt relations of the *Ant-Iſles* do ſpeak, which are of a ſize ſo Prodigious, that there are found ſome twenty foot long and ſeven thick. But Names are moſt frequently given to Fiſh by reaſon of ſome reſemblances that they have, as it is pretended, to certain things, whether that Similitude be taken from their ſhape, or diſpoſitions. Thus the *Sea-Sheep* has this Appellation, becauſe it is white, and has crooked Horns like that of the Land; and the *Sea-Calf* is by ſome called a *Wolf*, by reaſon that it lives on Rapine. Nevertheleſs by this reaſon it ſhould be called a *Sheep*, if compared to the *Sea-Sheep*; and the *Sea-Sheep* ought on the contrary to be called a *Wolf*, becauſe that according to *Ælian*, the *Sea-Sheep* hunts the *Sea-Calves*, and devours them.

The *Tongue* was very like to that of a *Calf*, being large, flat, and ſmooth. It was forked, and cut in two at the end, as *Ariſtotle* has remarqued; but not double, round, and ſmall, as in *Serpents*, and *Lizards*, as *Pliny* deſcribes it.

The *Larynx* had a particular formation, the *Epiglottis* being proportionably larger than in other Animals; it went half an inch in length beyond the *Glottis*, to cover it. It is probable that this is done more exactly to cloſe the entrance of the *Aſpera Arteria*, when this Animal eats his Prey at the bottom of the Sea, and to hinder the water from running into its Lungs.

The *Ventricle* was in form of an *Inteſtine*, which was contracted towards its two Orifices. *Severinus* deſcribes it round like an *Oſtrich*'s Egg. The interiour Membrane was folded, and made ſeveral wrinckles. *Severinus* deſcribes it without wrinckles. Theſe wrinckles from the Superiour Orifice to the middle of the *Ventricle* were waved, and from thence unto the *Pylorus* they were ſtrait. This ſeems to have ſome reſemblance with the *Ventricles* of Animals which chew the Cud, in which the wrinckles of the lower *Ventricle* are ſtrait, and according to the length of the *Ventricle*; whereas in the upper they are tranſverſal and oblique.

In the inſide of the *Ventricle* there was found a round bottom of the Sea-herb called by the Sea-men *Wreck*, which is a kind of *Fucus*. This clue or bottom was of the bigneſs and ſhape of a Nut. It cloſed the upper Orifice of the *Ventricle*, inſomuch that it ſeemed that this round lump had been puſh'd into this Orifice by the effort of an extraordinary compreſſion, and by the contraction of the *Ventricle*.

The *Liver* had ſix Lobes, two great ones underneath and behind, and four ſmall ones at the top and before. The *Gall-bladder* was between the great right Lobe behind, and the firſt of the ſmall ones which are before of the ſame ſide. *Belonius* reports according to *Ariſtotle*, that the *Sea-Calf* has no Gall. *Pliny* would have it in the Breaſt; which agrees not with what he relates, that this Animal vomits up its *Gall* when purſued by the Fiſher-men, by reaſon of the knowledge he has that he is taken only for his Gall, which is profitable for the Cure of ſeveral Diſeaſes: for it would be impoſſible for him to vomit up this Gall which is in his Breaſt, it being incredible that he can underſtand the intentions of the Fiſhermen: unleſs that this Sagacity be peculiar to it, and other *Amphibia*, ſuch as are the *Caſtor*, *Serpents*, and *Frogs*, which this ſame Author reports to take care to get rid of the things for which they are ſought after; ſo that the *Caſtor* tears off the *Pouches* wherein is contained the Medicinal Liquor of the *Caſtoreum*, the *Serpents* do ſwallow the precious Skin which they do caſt at the Spring, the *Frogs* do daily vomit up certain *Salutiferous* Liquors which are ingendred in their Bodies, for fear of being killed for this Liquor.

The *Kidneys* reſembled not thoſe of the *Otter*, as *Rondeletius* ſays, becauſe the Kidneys of the *Otter* are compoſed of ſeveral ſmall ſeparate ones, which have each their *Emulgent* Veſſels and particular *Ureters*, as is repreſented in the Figure of the Kidneys of the *Bear*. The Kidneys of our Subject were more like to the Kidneys of the *Land-Calf*, being cleft at top only in their Surface by chops which did not ſink very deep: but theſe chops were much more numerous than in the *Land-Calf*, and they made this Kidney to ſeem compoſed of ſeveral Glands joyned together. Theſe Kidneys did likewiſe differ from thoſe of the *Land-Calf*, in that beſides the great *Pelvis* which is in the gibbous part of that Kidney, there were ſeveral other ſmall ones ſcattered in ſeveral places in the Subſtance of the Kidney, inſomuch that it ſeemed that every of theſe ſmall *Pelves* appertained to each of the little particular Kidneys of which the great one was compoſed, and that the *Parenchyma* of every of theſe particular Kidneys made but one ſingle Maſs. The *Membrana Adipoſa* of the Kidney was all interſperſed with very viſible Veſſels, which made *Rondeletius* to ſay that the Emulgents enter not into the Cavity of the Kidney in the *Sea-Calf* as in other Animals,but that they are diſtributed over the whole Body of the Kidney. The greateſt part of theſe Veſſels in the left Kidney were the Branches, or rather the Roots of the Spermatick Vein, which by reuniting did form three great Branches, which the Trunck of the Spermatick Vein, that proceeds from the Emulgent, did by the way receive. This left Kidney was accompanied with a *Succenturiatus*, which was about the bigneſs of a *Filbert*, and immediately adhering to the Trunck of the *Vena Cava.*

The *Lungs* had but one Lobe on each ſide, which was only a little tranſverſly cut through the middle.

The *Heart* was round and flat. Its *Ventricles* appeared very large, and its *Auricles* very ſmall. The Trunck of the *Aorta* proceeded from the Heart two inches in length before it returned downwards. Underneath the great Aperture through which the Trunck of the *Vena Cava* conveyed the blood into the right *Ventricle* of the Heart, there was another which penetrated into the *Arteria Venoſa*, and from thence into the left *Ventricle*, and afterwards into the *Aorta*. This hole, which is called the *Foramen Ovale* in the *Fœtus*, makes the *Anaſtomoſis* by the means of which the blood goes from the *Cava* into the *Aorta* without paſſing through the Lungs; and it is apparently for the ſame uſe that this paſſage is found in the *Sea-Calf* and *Fœtus*, by reaſon of the neceſſity which each have of living without reſpiration, *viz.* the *Fœtus* whilſt in the Womb of its Mother, and the *Sea-Calf* whilſt under water. Which demonſtrates that Reſpiration is neceſſary for the Circulation, and that the Blood which the Lungs have received from one of the Ventricles of the Heart by being dilated, is afterwards thruſt into the other Ventricle by the compreſſion of the Heart. And it is probable that the facility which the *Sea-Calf* has of Diving a long time under water, muſt rather be attributed to this particular formation of the Veſſels of the Heart and Lungs, than to the ſmallneſs of the Lungs, which is the reaſon that *Pliny* alledges.

Between theſe two holes which were in the Trunck of the *Vena Cava*, there was a Membranous ſeparation made by a fold of the interiour Coat of the Vein.

In the Ventricles of the Heart, and in the Lungs, there was found great ſtore of Blood. *Pliny* reports that theſe parts in the *Sea-Calf* do contain leſs blood than in other Animals. This blood being kept congealed very firmly.

Ariſtotle and *Pliny* do affirm that the Bones of the *Sea-Calf* are Cartilaginous: we found that they were real Bones very hard, eſpecially thoſe of the *Cranium*. The *Dura Mater* was faſtned to the Skull, and redoubled to make the *Falx*. There was a bone between the *Cerebrum* and *Cerebellum* like as in *Dogs* and other Animals which do live by Rapine, and which do eat Fleſh, and not Graſs, like the Calf. This Bone was flat and pointed, and not round and maſſie, ſo as that which is found in the Head of the *Lamantin*, which is a kind of *Sea-Calf* of the *Weſt-Indies*, and which is held to be a Bone which has a peculiar Vertue for diſſolving the Stone of the Kidneys and Bladder.

The Sinuoſities and Cavities of the *Brain* were as in the Calf: but there was more of the *Cerebellum* proportionably than there is in the head of a *Calf*; which is unuſual in Fiſhes, which have very little *Cerebellum*. The *Glandula Pinealis* was two lines in length and little leſs in breadth. Naturaliſts have obſerved that this Animal participates nothing of the Stupidity of Fiſhes, but that it equalls the moſt ſubtill Sagacity of Terreſtrial Animals. *Pliny* teſtifies that there were ſhewn ſome at *Rome* which anſwered when they were called, and which with voice and geſture ſaluted the People in the Theatres. *Gomara* makes mention of a *Manati*, or *Sea-Calf* of the *Indies* of a prodigious ſize, which being tamed, did come when it was called by its name, and carried ten men upon its Back in a Lake where an *Indian* Prince kept it. *Aldrovandus* reports that he ſaw one which did *Sing* for the *Chriſtian* Princes and not for the *Turks*.

The *Cryſtalline* was almoſt Sphærical after the uſual manner of Fiſhes, and the more convex part was before, contrary to what is uſual. The whole *Choroides* was beſmeared with a white and very opake ſubſtance. In the *Retina* there were three branches of blood-veſſels, which did enter into the Eye with the Optick Nerve, and were ſpread over the whole Membrane. This Optick Nerve did enter into the middle of the Eye, and its entrance was directly oppoſite to the *Cryſtalline*.

Theſe two Remarks are favourable to the Opinion of thoſe which do hold that the reception of the viſual Species is made on the ſurface of the *Retina* and not the *Choroides*; becauſe that the Veſſels which being ſpread into the *Retina* are laid upon the *Choroides*, muſt, by reaſon of their Opacity, oppoſe the paſſage of the viſual Species, and hinder them from going to the *Choroides*: which theſe Veſſels do not in regard of the *Retina* becauſe, that it covers them with its ſurface which terminates and locks up the *Vitreous* Humour. The Situation of the Optick Nerve which was found in the *Axis* of the Eye, and which by conſequence did directly receive the viſual Species, ſeems to demonſtrate that it is not the *Choroides* which receives the Species, ſeeing that there is no *Choroides* at the principal place where the Species do fall; but that it is the *Retina* which is extended over the Optick Nerve as well as on all the other places on which the Species may fall.

The left *Eye* was contracted, and a great deal leſs than the right; and was found to have been hurt, the Humours being half ſuppurated. In the Eyes of this Subject there was not found the thouſand Colours which Natualiſts report to be there obſervable.

The Explication of the Figure of the Barbary Cow.

THE lower Figure is to diſcover the extraordinary length of the Head, the ſituation of the Eyes which are very high, the winding of the Horns, the length of the Neck, the Bunch which the Shoulders do form on the Back, that which is at the *Sternum* as in the *Camel*, the ſmallneſs of the Tail, and other particularities which do render the Figure of the Animal different from the ordinary *Cow*.

In the Upper Figure.

A. *Is the great* Ventricle.
B B B. *The three other* Ventricles.
C C. *The Origine of the* Epiploon.
D D. *The* Pancreas.
E. *A part of the* Aſpera Arteria *in its natural bigneſs.*
e e e. *The Membranous part of the* Aſpera Arteria *on which the* Oeſophagus *lies, and which is towards the* Vertebræ *of the* Neck.
e e e. *The Extremities of the half Rings of the* Aſpera Arteria *flatted and inlarged, making as it were the Wings which do cover the Extremitys of the other half Rings which are underneath, and are repreſented by f f f.*
g g. *The hollow and Chanellated part of the half Rings.*
F F. *The* Liver.
G. *The* Gall-Bladder.
Γ. *The Trunck of the* Vena Porta *faſtned to the Liver.*
H. *Half of the Trunck of the* Vena Porta *looſed from the Liver, to diſcover its interiour ſurface.*
I I. *The holes of the branches of the* Vena Porta *which do enter into the Subſtance of the* Liver, *with the Valves which do half ſhut them.*
K. *The* Head *ſeen in another Aſpect than that of the lower Figure, to repreſent the particular winding of the Horns.*
L L L L L. *The five ſmall Lobes of the* Lungs.
M M. *The two great Lobes.*
n. *The Ligament which faſtens the two great Lobes to one another.*

THE

THE ANATOMICAL DESCRIPTION OF A BARBARY COW.

THis Animal was about the ſize of a *Cow.* Its *Hair* was of a *Fox-red,* paler towards the point than the root. It was a little ſhorter than it commonly is in *Cows,* and almoſt of the ſame bigneſs towards the point as the root: which is contrary to the Hair of Animals, which is moſt frequently bigger towards the root than towards the other end. Yet we have before remarqued an irregularity oppoſite to this in the Hair of an *Elk,* which was a great deal ſmaller towards the root than towards the middle.

The diſpoſition of the Body, Legs, and Neck made it better to reſemble a *Stag* than a *Cow,* of which it had only the *Hornes,* which were in a great many things different from thoſe of *Cows.* They were each of them a foot long, and took their riſe very near one another, by reaſon the Head was in this part exceeding narrow. They were very thick, bent backward, black, wreathed like a Screw, and worn before and at top, ſo that the raiſed parts which formed the Screw, were there wholly effaced. The *Tail* was larger at its beginning than towards its end, after the manner of all the cloven footed *Quadrupeds* of *Barbary* which we have Diſſected. It exceeded not thirteen Inches in length comprehending a tuft of black hair three inches long, which it had at its extremity. The *Ears* were ſeated not at top of the *Temples,* and underneath the *Horns* as in *Cows,* but more backward: as for the reſt they were like to the *Ears* of the *Gazella,* being covered in the inſide with a white Hair in ſome places, the reſt being bald, and diſcovering a skin perfectly black and ſmooth. The *Eyes* were ſo high and ſo near the *Horns,* that the *Head* ſeemed to have almoſt no fore-head.

The *Teats* were very little, very ſhort, and only two in number: which rendred them different from thoſe of *Cows.* The *Shoulders* were very high, making a bunch at the beginning of the Back. There was another bunch oppoſite to this of the Back, *viz.* at the bottom of the *Sternum,* like as in the *Camel.*

We found that all the particulars which are obſerved in this Animal were ſeen in the *Bubalus* which *Aldrovandus* deſcribes, and the Figure of which was ſent him by *Horatius Fontana.* There is only the bunch of the *Sternum* which neither *Aldrovandus* nor *Fontana* do ſpeak of. It is probable that this Animal ought rather to be taken for the *Bubalus* of the Ancients,than the little *African Ox* which *Belonius* deſcribes: for *Ariſtotle* compares the *Bubalus* to the *Stagg. Ælian* reports that it is very nimble footed; *Oppian* attributes to it Horns bent backward; and *Pliny* averrs that it altogether reſembles a *Calf* and a *Stagg.* But there is not found any of theſe marks in the Animal which *Belonius* deſcribes, and they all occurr in the Animal which we ſpeak of, as may be eaſily demonſtrated, if reflection be made on all the particulars before remarqued. But it is no wonder that *Belonius* is deceived in attributing to his little *Ox* the name of *Bubalus,* ſeeing that *Pliny* teſtifies that even in his time this word and appellation was very equivocal, and that it was given to Animals which had no ſimilitude with the *Bubalus.*

As for the inward parts, the *Epiploon* incloſed and covered the *Ventricles.* It was Compoſed of a Membrane very thin, but continued and not pierced. The Veſſels were included in a thick Caul. Its Ligatures were faſtned to the two laſt *Ventricles, viz.* from the *Pylorus* to the ſecond *Ventricle,* to the upper part which touches the *Diaphragme,* and from thence it extended over the two firſt, by bending it ſelf towards the left ſide.

The *Ventricles* were in number four. The *firſt* and greateſt was velveted with an infinite number of ſmall Teats, which made the exteriour ſurface of the internal Membrane of this *Ventricle,* as it is in the generality of other Animals which chew the Cud: but this Membrane was eaſily ſeparable from the external as in the *Gazella.* The *ſecond Ventricle* had its internal Membrane in form of Net-work; and this Net-work, as in *Sheep,* was nothing elſe but the Folds of this Membrane, which was looſer than the external; and theſe folds were of different Figures, ſome Triangular, others Square, and others Pentagonal. The *third,* as uſual had its internal Membrane much looſer than the *ſecond,* and the folds which it had were more raiſed, but they were all ranged long-wiſe, making as it were leaves indented. The *Fourth,* which alone was greater than the Second and Third together, was likewiſe filled with Leaves; but they were without indentures, and their Situation was tranſverſe, as it were to ſtop and retain the Nouriſhment a longer time. Such a Structure has been obſerved in the *Sea-Fox,* where the Cavity of the *Inteſtine* was interrupted by Membranes tranſverſly ſituated, and diſpoſed like a *Snail-ſhell* or Newel of a winding Stair-caſe; and this very tranſverſe Situation of Leaves has been found in the *Cæcum* of *Apes,* in the *Colon* of *Hares,* and *Rabits,* in the *Colons* and two *Cæcums* of *Oſtriches,* and in the *Jejunum* of *Man.* The Colour of this laſt *Ventricle* was very different from that of the others, being of a very darkred.

The *Inteſtines* were all together ſeventy and eight feet. The *Cæcum* was eighteen inches long, and three broad. It had a Nervous Ligament, which nevertheleſs cauſed not any Cells.

The *Pancreas* was faſtened along the little *Ventricles.* The *Spleen* was ten inches in length and four in breadth. It was half joyned to the *Ventricle.*

The *Liver* was round and without Lobes, being only a little cleft before and behind. In the Trunk of the *Vena Porta* there was obſerved little Membranes in form of Valves, which half covered the holes of the branches which do carry the blood from the Trunck of the *Porta* into the Subſtance of the *Liver*, to hinder it from returning into the Trunck. Theſe Valves which have not been yet ſeen in the *Liver* of any Animal, are very favourable to the Pulſation, which *Gliſſon* attributes to the branches which the *Porta* caſts into the Liver: for this pulſation, which he thinks to be communicated to them by the Arteries, which are joyned and faſtened to them by the aſſiſtance of a *Capſula*, which incloſes the Vein with the Artery: this *Capſula* having a particular motion of conſtriction, is not eaſie to conceive without theſe Valves; it being hard for the blood lock'd up in theſe Veins to form any pulſation when it is ſtruck by the dilatation of the neighbouring Arteries, if not incloſed and retained by ſome adjoyning obſtacle, ſuch as is that of the Valves; otherwiſe it will neceſſarily flow back into the Trunck, and Branches which do convey the blood thither: for the impetuoſity of the motion of this blood towards the trunck cannot ſupply this obſtacle, as *Gliſſon* pretends, by reaſon of the weakneſs of the Tunicle of the Veins, which do bring this blood into the Trunck: for theſe Veins would have more need of a *Capſula* to be ſtrengthned, than the branches which are in the *Liver*, the *Parenchyma* whereof might be ſufficient to ſtrengthen them. So that it ſeems that for want of theſe Valves, the beating would be much greater in the Branches which do convey the Blood into the Trunck of the *Vena Porta*, than in thoſe which do diſtribute it into the Subſtance of the Liver; and that this beating muſt be as contrary to the motion of the blood contained in theſe branches, as advantagious to that which muſt be diſtributed in the *Liver*.

The *Gall-bladder* was at the extremity and on the edge of the hollow part on the right ſide. It was faſtned to the Liver by its internal half, and the Membrane which made the outward half was thin, fine, and all folded, being intirely void of *Gall*.

The *Lungs* had ſeven Lobes: the five upper ones were ſmall; the two lower contained nine inches in length and five in breadth. They were faſtned to each other towards the middle by a Membranous Ligament half an inch broad, and two thirds of an inch long.

The Rings of the *Aſpera Arteria* which were imperfect, did leave the ſpace of a fingers breadth without a Cartilage at the place towards the Back-bone, and which touches the *Oeſophagus*. Theſe Rings were of ſuch a Figure, and ſo diſpoſed, that their extremities flatned, and inlarged, did each form as it were two Wings or Auricles, which were laid one upon the other; ſo that for inſtance the lower Wings or Auricles of the firſt Cartilage were covered with the upper Wings of the ſecond, which with its lower wings did likewiſe cover the upper wings of the third, which did cover its lower wings with the upper ones of the fourth. This continued after the ſame manner in all the Cartilages of the *Aſpera Arteria*, as is repreſented in the Figure, which alone can ſufficiently demonſtrate this extraordinary Structure. The reſidue of every Ring, which was the hardeſt part, was hollow in its middle, and left two eminencies at its ſides. This conformation did in this place make the *Aſpera Arteria* more rough than it generally is; becauſe that the inequality

equality of the two different Subſtances which compoſe it, namely, the Membrane, and Cartilage which is found in all ſorts of *Aſperæ Arteriæ*, this had over and above the inequality which the Cavities or Indentings, that were in each Ring, did make.

The *Cornea* in the *Eye* was of an oval Figure, as it uſually is in other *Cows*. The *Iris* was *Yellow*, a little inclining to *Red*. The *Cryſtallinus* was more convex behind than before.

The Explication of the Figure of the CORMORANT.

IN the Lower Figure is obſervable the length of the Head, the ſmalneſs of the Eye, and its oblique Situation, the crooked Figure of the Bill, and the extraordinary Structure of the Feet which have the great Toe outwards, and the others inwards, being all four webb'd together by Membranes.

In the Upper Figure.

A B. *Repreſents the* Oeſophagus *blown up, and tied at the top.*
B C. *The* Ventricle *blown up.*
B. *The place where the* Oeſophagus *is ſtraitned to make the upper Orifice of the* Ventricle.
D E. *The* Aſpera Arteria.
E. *A knot made of a Bony Ring at the bottom of the* Aſpera Arteria.
F F. *Two Muſculous Ligaments which do faſten the* Aſpera Arteria *with the Bladders of the* Lungs.
G. *The* Heart.
H. *The right Lobe of the* Liver.
I. *The left Lobe.*
K. *The third Lobe, which is under the two others.*
L. *The* Gall-Bladder.
M. *The* Pylorus.
N. *A part of the* Oeſophagus, *the inſide of which is repreſented.*
O. *The Superiour Orifice of the* Ventricle.
P. *A part of the* Ventricle *which is ſeen on the inſide.*
q q. *The Membranes of the* Ventricle *cut aſunder, the interiour of which is compoſed of an infinite number of longiſh Glands conglomerated, and whoſe points do make the internal Superficies of the* Ventricle *rough like* Chagrin.
Q. *The* Larynx.
R. *The* Tongue.
S T. *The* right Foot.
T. *The* Serrate *or toothed* Claw *which is on the ſecond Toe.*

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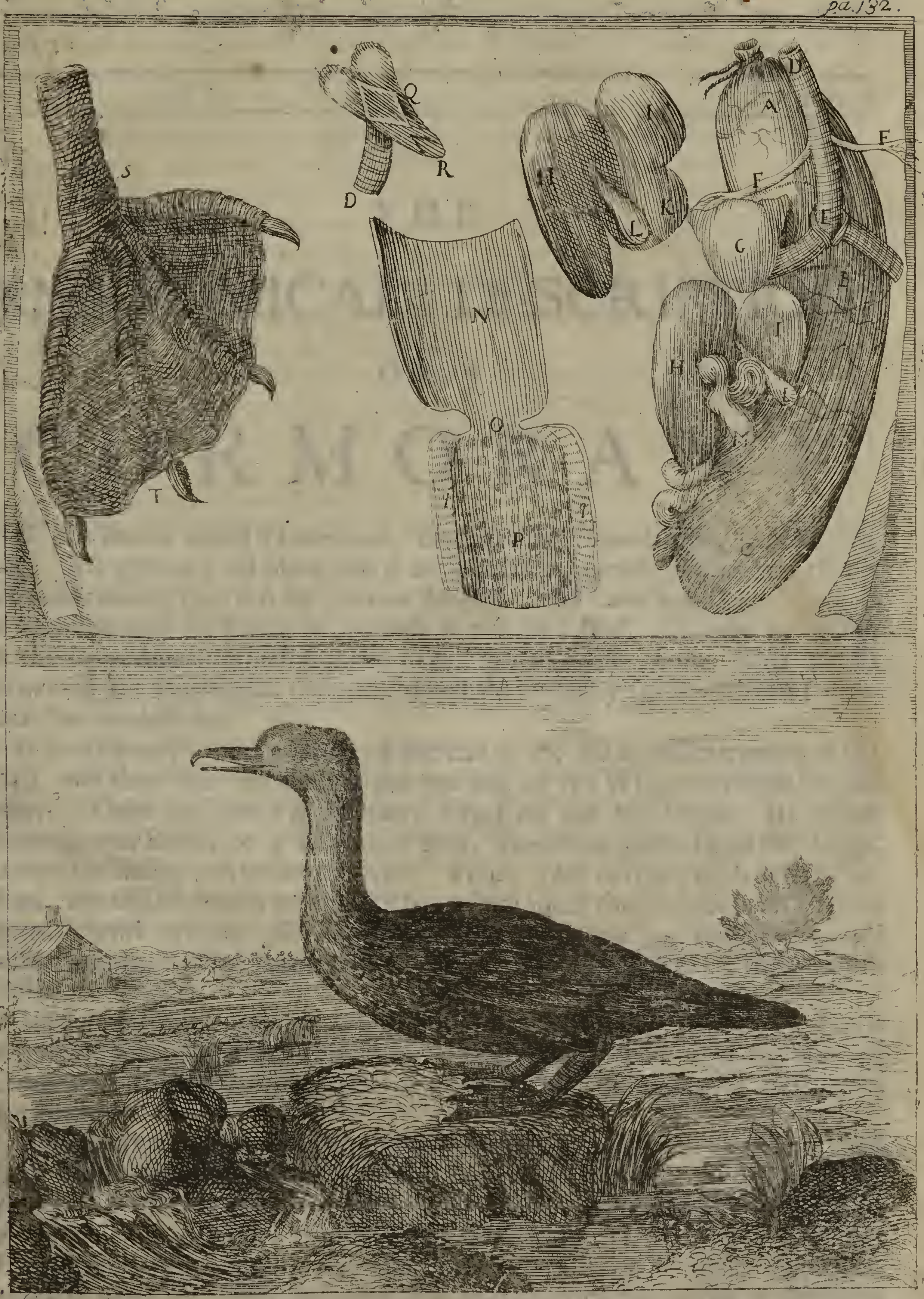

THE ANATOMICAL DESCRIPTION OF A CORMORANT.

THis Bird is called a *Cormorant*, that is to ſay *Crow-Marine*, becauſe that it is generally all black,and is an Aquatick Animal. *Geſner* ſays that it is for this reaſon that it is by *Albertus Magnus* called *Carbo aquaticus*. *Gaza* is of Opinion that the *Corax* of *Ariſtotle* is this very Bird, not only by reaſon of the *Greek* Name, which ſignifies *Crow*, but likewiſe of the other marks by which this Philoſopher deſigns it,which do perfectly agree with the *Cormorant* that we deſcribe.

It was twenty ſeven inches from the end of the Bill to the extremity of the Tail, and three foot and a half from one end of the Wings expanded to the other. There are ſeen a great many larger on the Sea-Shore. Its whole Plumage was Black, or a very dark gray, ſomewhat greeniſh on the wings, except the Belly, and under the Neck, which were covered with white Feathers, the end of which was blackiſh: which made theſe white parts to ſeem ſpotted with brown, *Geſner* reports that in *Switzerland* theſe *Cormorants* which are there called *Scharbi*, that is to ſay *Coals*, have ſome of them white Bellies.

Under the great plumes which cover the Body, there was a gray down extremely fine and thick, as in *Swans*. *Aldrovandus* reports that the Skins of *Cormorants* are prepared like thoſe of *Vultures*, and uſed to cover and warm the Stomach.

The Feathers which did garniſh and adorn the Neck were very ſhort, and thoſe which did cover the Head much ſhorter: but they were very thick and ſmall like Fringe. This demonſtrates the *Cormorant* not to be the *Phalocrocorax*, which is ſo called; becauſe it has no Feathers on the Head, and that *Pliny* is deceived, when he ſays that the aquatick *Crow*, which is the *Cormorant*, is naturally bald, and that this particularity has given it the name which it has amongſt the *Greeks*. *Belonius* held the ſame Opinion. Theſe Plumes upon the Head were four lines in length, ſtrait, and ſtaring. This made the Head to appear leſs flat than indeed it is, although it very much appeared ſo with theſe Feathers.

Towards the root, as well of the upper as lower Beak, there was a Skin without Feathers: it was likewiſe extended round the Eye. This Skin was Red. *Aldrovandus* reports that it is generally white, and *Geſner* makes it of a *Saffron*-Colour. This ſame Skin was extended under the Beak, upon the Cavity which is generally there. In this place it was of a Pale-yellow.

The *Bill* at the ſides was Gray mix'd with Red, and Black at the top. It was three inches in length, from the opening to its extremity. It was crooked, and very pointed at the end. This *Beak* ſerved him to catch Fiſh; but becauſe that he could only ſwallow them backwards, or ſidewiſe, and could not conveniently ſwallow the Tail firſt, by reaſon of the Fins, Creſts, and Scales, which hindred them from entring into his Throat, he uſed to caſt them in the Air, to receive them with the Head firſt: which he does with ſo much dexterity that he never miſſes. This Bird is made uſe of for Fiſhing, by putting an Iron Ring at the bottom of its Neck, to the end that the Fiſh being received into the *Oeſophagus*, which is very large, making a kind of Craw, might not enter into the *Ventricle*, and they might eaſily be made to caſt them up.

In the *Beak* there was not any hole for the Noſtrils, although in the Palate there was one large enough to permit the Vapours to riſe up to the Organs of the Smelling.

The *Eyes* were ſmall, and ſituated very near the Bill. Being ſhut, the line which the Eye-lids made, was ſomewhat more oblique than it generally is in Birds.

The *Feet* were ſhort, not exceeding four inches from the Belly to the Ground, and there were ſeven to the end of the greateſt Toe. Theſe Feet were very black, and ſhining, covered with long, and ſtrait Scales in the inſide of the Foot, and on the middle of the Toes. Theſe four Toes were webb'd together by ſome Membranes, which we have already remark'd in a *Scotch Gooſe*. Theſe Membranes were ſpeckled like *Chagrin*. Theſe four Toes, which were all of a row, went leſſening from the great to the little one. The great and little one did make a right Angle, the great one being on the outſide, and the little one on the inſide. The two other Toes were likewiſe on the inſide, between the great and little one; which is unuſual in other two-footed Animals, eſpecially Man, whoſe Foot has the great Toe inwards, and the others outwards: for this is ſo made to ſupport and more firmly to ſettle the Body on the Feet, on which the Prominence or Protuberance which the toe has on the outſide is neceſſary, to hinder it from bending on either ſide; but this prominence is wholly uſeleſs on the inſide; becauſe that the oppoſite Leg ſufficiently ſupports the Body on that ſide. Theſe Toes had ſharp and crooked Claws: the greateſt exceeded not five lines. Yet there was this remarkable in theſe Claws, that thoſe of the ſecond toe, which is next to the greateſt, were ſerrate or toothed in each Foot, on the ſide towards the third toe. The great toe, which was three inches long, was compoſed of five bones or *Phalanges*, the next of four, the third of three, and the fourth, which is the leaſt, of two. This laſt was an inch long. *Ariſtotle* reports that the *Cormorant* is the only *Ducker* which Perches on Trees, and which makes its Neſt there. We have obſerved that the Feet like thoſe of our *Cormorant*, are more commodious for Perching than are thoſe of other

Duckers, though theſe feet can claſp the branches only with two of their four toes, namely, with the greateſt, and leaſt: but this little one is much larger than in other *Palmipedes*, which have the little toe behind ſo ſhort, that it is only as a Spur, abſolutely uſeleſs to gripe the branches.

The conſtruction of the Foot of our *Cormorant* appeared to us not only more commodious than it is in other *Palmipedes*, in regard of the facility which is given it to Perch it ſelf, but is alſo very advantagious for Swiming: for whereas other *Palmipedes* have only two Membranes which do joyn the three toes before, our *Cormorant* had three which webb'd the four toes together: for which reaſon theſe Birds do go under water with an incredible quickneſs. *Geſner* reports that the feet do ſometimes ſerve them to catch the Fiſh, and that they do bring it to the Shore holding it with one foot, and ſwiming with the other. This particular uſe, *viz.* of having occaſion to ſwim with one ſingle foot, may make us to comprehend the reaſon of the extraordinary Structure of the *Cormorant*'s feet: for if the toes and their Membranes which do form the foot, had been outwards, it would have been impoſſible for the Bird to go otherwiſe than by turning round when it ſwims only with one foot, as it happens to a Boat when rowed but with one Oar; whereas the toes being inwards, it happens that when the Bird ſwims with one ſingle foot, it ſtrikes the water exactly under the middle of the Belly, and makes not his Body to waddle on the one ſide or the other. Now this formation was ſo much the more neceſſary, as its feet are ſhorter: for if they had been longer, they would have had a facility which they have not to be turned obliquely under the Belly, to place the foot in the middle, and not to ſtrike on one ſide more than on the other.

The *Oeſophagus* was ſeated at the right ſide of the *Aſpera Arteria*, under which it paſſed to reach the *Ventricle*. When it was puffed up by blowing on the inſide, it was inlarged to above two inches in Diameter. Being come directly over the *Bifurcation* of the *Aſpera Arteria*, it was turned on the left ſide, and was ſuddenly ſtraitned, leaving for the upper Orifice of the *Ventricle* but one Aperture about the bigneſs of a quill. This contracting appeared not when the *Oeſophagus* and *Ventricle* were blown up; for then they made only one ſingle Bowel. This *Ventricle* was fleſhy and Muſculous towards the bottom; but it was Membranous in its upper part, perhaps to inlarge and contract it ſelf according to the need that it has for the ſwallowing Fiſhes, and for the incloſing them afterward in the *Ventricle*, where the concoction, which is begun in the *Oeſophagus*, muſt be compleated: for the greatneſs of the Fiſh which theſe Birds are ſeen to ſwallow is a very ſtrange and amazing thing.

The *Ventricle* and *Oeſophagus* did ſeem of the ſame Figure and ſize, being viewed on the outſide, after that both had been ſtrongly puffed up by the wind which was forceably made to enter therein: but the *Ventricle* was narrower, and not ſo capacious on the inſide, by reaſon of the thickneſs of the two Membranes, whereof it was compoſed, which together did make the thickneſs of two lines. The *Pylorus* was not oppoſite to the Superiour Orifice, as is commonly obſerved, but it was as it were fixed into the middle of the *Ventricle*, leaving the lower half hanging like a Sack. This lower part was fleſhy, and as it were Muſculous, like a Gizard; although this fleſhie Membrane had neither the thickneſs nor hardneſs which is ordinarily remarked in the Gizzard of Birds. And it is probable that this part was thus fleſhie and Muſculous, to ſerve to ſqueeze and more eaſily to make aſcend towards the *Pylorus* that which is deſcended to the long and narrow bottom of the *Ventricle*, when the concoction of the aliment is there finiſhed; the hard and Fibrous Fleſh of the Gizards being made more ſtrongly to compreſs, and as it were to bruiſe the hard and dry grains which Birds do feed on, and not being neceſſary for thoſe which do live only upon Fleſh, or Fiſh like the *Cormorant*.

The external Membrane of the *Ventricle* was white, and appeared of two ſubſtances; its external part being Nervous and hard at top, and fleſhie at bottom, as has been declared, and its internal part being quaggie, and mucous, ſo that it ſeemed that by the means of this internal part the two Membranes of the *Ventricle* were glued together. The internal Membrane, which was ſomewhat reddiſh, was Glandulous, and compoſed of an infinite number of ſmall Glands a line and a half long, and about the thickneſs of a great pin: theſe little Glands did touch each other, according to their length, and were faſtened, and as it were glued together, by a ſubſtance reſembling their own, but ſomewhat leſs firm, and ſlimie. Their extremities were more firmly faſtend, *viz.* the lower ones which proceeded from the external Membrane of the Ventricle, and the upper ones which did adhere each to other, and did form the internal Superficies of the Ventricle; ſo that both the ends of the Glands did render this internal Superficies like Chagrin; which doth very well repreſent the Velvet of the great Ventricle of Animals, which chew not the Cud, if it be imagined that the little long Teats which do compoſe this Velvet were joyned to each other, as conglomerated Glands generally are; whereas in Animals which chew the Cud, theſe little Teats are ſeparated from each other, being only faſtned to the internal Membrane of the great Ventricle by their roots. In ſome *Oſtriches* we have found the internal Membrane of the Gizzard of a Structure wholly like to this.

In the Superiour part of the Ventricle towards the Orifice, there were ſeveral Worms eight or ten lines long, and about the thickneſs of a midling pin. They were white and tranſparent, and in the middle of their body there was ſeen as it were a blackiſh Vein, going from the Head to the Tail which was more pointed than the Head, which was ſmaller than the middle of the Body. At the bottom of the Ventricle there was a matter like to black blood half curdled. And it is probable that it was in effect from the blood which was fallen into this place, by reaſon of a blow which the Bird had received upon the head.

The *Inteſtines* were ſeven foot long. They had not thoſe two *Appendices* which do form as it were two *Cæcums*, which *Belonius* reports to be in all Birds. We found that theſe ſorts of Inteſtines were likewiſe wanting in an *Eagle* called *Haliaetos*, and ſome other Birds. All the Inteſtines of our *Cormorant* were of the ſame bigneſs, containing two lines diameter. They were incloſed with the Ventricle in an *Epiploon*, which *Pliny* averrs, not to be in theſe Birds. This *Epiploon* had a great deal of Fat, hard like

Tallow. On the Ventricle and Gall-Bladler there was ſome of this Fat faſtened, and ſeparated from the *Epiploon*, which is a thing very particular.

The *Kidneys* were lock'd up and ſeparated from the other parts of the lower Belly, by the means of a Membrane which did cover them. They had an extraordinary Figure, not being divided into three Lobes as they generally are in Birds, but toothed like a Cock's Comb in their gibbous part. *Ariſtotle* ſays that Oviparous Animals, like Birds and Fiſh, have neither Kidneys nor Bladder, except the Sea-*Tortois*. We have not yet found any Bird that wanted Kidneys or *Vreters*. As for the Bladder, the truth is they have no other Receptacles for their Urine, but the extremity of the *Rectum*, which is commonly more dilated in Birds than in terreſtrial Animals, and having ſometimes a roundneſs like to a Bladder, as is ſeen in the *Oſtrich*. The *Camelion*, which is no Bird, but yet oviparous, has likewiſe Kidneys and Ureters which do convey its Urine into the Pouch of the *Rectum*, as in Birds.

The *Liver* which was of a red as clear as Fleſh-Colour, was ſmall. It had three Lobes, two before, as is generally ſeen in other Birds; but the left was not half ſo large as the right: the third was under the left, almoſt of its form and ſize. The whole Liver was ſeated on the right ſide. The *Ventricle* took up the left. The *Gall-Bladder* was ſeparated from the Liver, being faſtened there only by its Neck, as we have found it in *Eagles*: this is likewiſe obſerved in ſome other Birds. The bottom of this Bladder touched the Ventricle. It was an inch in length, and three lines lines in breadth.

The *Spleen* was an inch long, a line and a half thick, of a ſomewhat darker Colour than the Liver. Its Figure was Semicircular. It touched the left part of the Ventricle, but was not faſtened by any apparent Veſſels. It was very adherent to the *Pancreas*, which reached very far, after the uſual manner of Birds, into the Sinuoſity which forms the firſt fold of the Inteſtines. It was of a whitiſh Fleſh-Colour: ſeveral Veſſels did faſten it to the hollow part of the Liver near the Origine of the Gall-Bladder. Its inſertion into the Inteſtine was near that of the Bladder.

The *Aſpera Arteria* had its Rings intire. At the place where it was divided, in the *Thorax*, there was a great Bony and very hard Ring. There were two Muſcles or Fleſhie Ligaments, which did tie the *Aſpera Arteria* towards the place where it enters into the *Thorax*. Theſe Muſcles, which in the generality of Birds do knit the *Aſpera Arteria* to the *Sternum*, did in this joyn it to the Bladders of the Lungs, when being divided into ſeveral tendons, theſe tendons became Membranous and made as it were a *Gooſes* Foot.

The *Heart* was ſhut up in a *Pericardium* where there was a clear and lymphid water. It was almoſt round, its point being very blunt. Its *Auricles* were very little, eſpecially the left: It deſcended not between the two Lobes of the Liver as in moſt Birds, the Liver being quite underneath its point.

The *Tongue* was very ſmall, not exceeding three lines in length: It was double, having two points, one whereof, which was round and fleſhie, did bend outwards; the other, which was Membranous and Cartilaginous, did tend toward the *Larynx*, which was hard and bony.

The *Eye* was but half an inch Diameter. The *Cornea* was of a tranſparent and very briſk red, like to that curious Enamel which the *French* do call *Rouge-clair*. It is probable that this red proceeded from the extravaſated blood between the two Tunicles, whereof the *Cornea* was compoſed: for theſe Tunicles were eaſily ſeparable, and this Bird had been hit ſeveral blows upon the Head. The *Cryſtalline* was ſmall, being ſcarcely a line in Diameter. Its Figure was Sphærical, as it ordinarily is in Fiſh, perhaps by reaſon that this Animal ought to ſee clear in the water where it goes to catch its Prey. It was a little depreſſed before.

This Bird was killed at *Sceaux*, when being brought into the Kitchin of an Inne, he there flew at the Cook, whom he bit. One of his Wings was broken, and his Skull bent in, when brought to us.

The Explication of the Figure of the CHAMOIS *or* GEMP.

THe lower Figure repreſents the different Colours of the Hair, the greatneſs of the Eyes, the turning of the Hornes backward, and after what manner the upper Lip is cleft.

In the Upper Figure.

A A. *The right* Lobe *of the* Liuer.
B. *The left* Lobe.
C. *The little* Lobe.
D D. *The great* Ventricle.
E F D. *The* Epiploon *which covers the firſt and third* Ventricle *to which it is faſtened.* E. *Is a part of the* Epiploon, *which is raiſed to diſcover the great* Ventricle.
E F. *The third* Ventricle *covered with the* Epiploon.
G. *The ſecond* Ventricle.
H. *The Ball which was found in the third* Ventricle.
I I. *The* Vaſa Spermatica Præparantia.
K K. *The Branches of the* Præparantia *which go to the* Bladder.
L I. *The Branches which go to the Neck of the* Uterus.
M M. *The Branches which go to the* Teſticles.
N N. *The Branches which do go to the* Cornua Uteri.
O O. *The* Teſticles.
P P. *The* Cornua Uteri.
Q. *The* Bladder.
R. *A* Callous Apophysis *at the Point of the Heart.*
S. *The* Cryſtalline *Cleft in three.*
T T. *The* Oeſophagus.
V. *The* Pylorus.

THE

THE ANATOMICAL DESCRIPTION OF A CHAMOIS OR GEMP.

THe *Chamois* or *Gemp* which we deſcribe was ſomewhat bigger than a *Goat*. It had longer leggs ; the Hair in recompence was ſhorter. The longeſt, which adorned the Belly and Thighs, exceeded not four Inches and a half ; on the Back it was much ſhorter. The Hair which did cover the Back and Flanks was of two ſorts : For beſides the great hair which did appear, there was a ſmall one very ſhort, and fine, hid underneath, about the roots of the greateſt, as in the *Caſtor*. The Head, Belly, and Leggs had only the great Hair. At the places where this Hair was long, as at the top of the Head, on the Neck, Back, Flanks, and Belly, it was a little frizled, and waved as in *Goats*.

The Ridge of the Back, the top of the Stomach, the bottom of the Throat, Flanks, the Crown of the Head, and outſide of the Ears, was of a dark *Minime* Colour. From the Ears to the Noſtrills there was likewiſe a liſt of the ſame Colour, which ſurrounded the Eyes. The reſt of the Hair was of a foul reddiſh white.

The *Tail* exceeded not three Inches in length. The *Ears* were five. On the inſide they were bordered with a white Hair. The reſt was ſmooth and of a dark Cheſtnut-Colour.

The *Eyes* were large: They had an internal Eye-lid which was drawn towards the little corner of the Eye: it was red. 'Tis perhaps upon this account that *Albertus* affirmes that the *Chamois* has Red Eyes. The upper Lip was a little Cleft, in the middle, as in the *Hare.*

The *Hornes* grew on the fore-part of the brow a little above the Eyes. The Colour thereof was black. They were round and ray'd in Circles and not like a Screw. *Oppian* calls the *Chamois Strepſiceros*, that is to ſay an Animal with turned Hornes. *Aldrovandus* and *Geſner* do interpret this Equivocal word, and do upon good grounds believe that *Oppian* meant that theſe Horn's are turned and bent backward, and not turned like a Screw as they are in the Sheep of *Candia* which *Belonius* calls *Strepſiceros*. Indeed, the Hornes of our *Chamois* were turned backwards: but becauſe he was young, they were not crooked as they are in the more Aged, in which they do grow ſo bending backward, and ſo Pointed, that it is reported that theſe Animals do tare their Skin in ſcratching themſelves; and that it ſometimes happens that they do there remain ſo intangled, that they cannot gett them out again; which is the reaſon that they are Famiſht to Death. It is alſo reported that theſe hooks do ſerve to ſtay them when they do fall from the top of the Rocks on which they do love to run.

It is doubted whether the *Chamois* is the Animal which *Pliny* calls *Rupicapra*, or whither it is the *Caprea*; for *Pliny* ſays that there are two kinds of wild *Goats*. *Jonſton* thinks that the *Caprea* of *Pliny* is the *Chevreuil*. *Scaliger* is of Opinion that the *Caprea* is the *Chamois*, and that the *Chevreuil* is the *Capreolus* which *Votto* explaining *Columella* diſtinguiſhes not from *Caprea* no more than *Aldrovandus*, who ſays that *Caprea* is in *French* called *Chevreuil*: ſo that *Rupicapra*, according to *Scaliger*, is a common *Genus* to *Caprea* and *Ibex*. yet it is probable that the *Rupicapra* of the Ancients is our *Chamois*, becauſe *Pliny* ſays that the *Rupicapra* is different from the *Dama*, in that it has Horns turned backward, and that the *Dama*, which is another Animal than our *Doe*, has them turned forward: and he moreover reports that the *Caprea* has branching Horns; which correſponds to the *Chevreuil*. *Belonius* pretends that the *Chamois* derives its name from the *Greek* word *Kemas*: but the deſcription which *Ælian* gives of the *Kemas*, makes it appear very different from the *Chamois*: for amongſt other things he ſays that the *Kemas* has Horns turned forwards. He likewiſe affirms that it has the Ears garniſhed with a very thick Hair, which was not found in our *Chamois*, as has been already remarked. Now *Scaliger*, who reaſonably complains of the little exactneſs which the Ancients uſed to deſcribe, and rightly diſtinguiſh Animals by their proper names; has himſelf greatly contributed to the confuſion which is at preſent found in the names of all the *Goat-kind*, of which this is one. For beſides the confuſion which he makes of *Caprea* with *Rupicapra*, he likewiſe gives *Aldrovandus* and *Geſner* occaſion to think that the *Kemas*, which he takes for the *Chamois*, is in *French* called *Faon*; and this Error of *Scaliger* proceeds from his not making the diſtinction that there is between *Kemas*, according to its common ſignification, and *Kemas*, according to that in which the Poets do uſe it: for according to the firſt, it in truth ſignifies our *Fawn*; *Kemas* coming from κοιμᾶν, which ſignifies to ſleep, or to be lain down, becauſe that the *Fawns* of Savage Beaſts dare not to go out of the Dens and Caverns where they do ſleep and are uſually layd : but according to the ſecond ſignification which is particular to the Poets, as *Ælian* reports, it ſignifies an Animal wholly different from the Fawn of the *Deer*, and other Animals, which in *French* are called *Faon*.

Our *Chamois* had *Inciſores* only in the lower Jaw, like other Animals which chew the Cud. They were eight in number, and uneven ; thoſe of the middle being a great deal larger than thoſe which were at the ſides, reſembling thoſe in the *Gazella*.

The *Feet* were cloven, and hollow underneath, and not filled with Fleſh as in the *Gazella* ; for the fleſh was drawn inwards, ſo that each Claw made a print in the Earth like a Horſe's, and the extremity of the horn, which bore upon the ground was very ſharp.

The anteriour part of the *Epiploon* was faſtned on the left ſide to the firſt *Ventricle*. In paſſing to the right ſide, it was joyned to the third : deſcending from thence it went underneath the lower part of the firſt, and by reaſcending behind was faſtened to the bottom of this firſt Ventricle ; ſo that this *Epiploon* was not laid on the *Inteſtines* as it generally is.

There was three *Ventricles*. The firſt, which was the greateſt, was compoſed of two Membranes, the interiour of which was Velveted, and might be eaſily ſeparated from the external. The Second, which was the leaſt, had ſome wrinckles raiſed on the inſide, which did form different Figures, and compoſed as it were a Net. The Third, which was of a middle ſize, had dentilated leaves, ſuch as are in the third *Ventricle* of *Oxen*. *Bartholinus* has found in the *Chamois* which he deſcribes, that the two Orifices of the Ventricle, (for he ſpeaks only of one) were very near each other; but in our Subject they were very diſtant, as the Figure demonſtrates. The third Ventricle had a ſtrange body, faſtened to its interiour Membrane. This Body was compoſed of a hard Membrane, in which there was Gravel incloſed. *Geſner* ſays that the *Chamois* uſes to ſwallow Gravel to clear his Tongue and Throat, which are generally bedaubed with *Pituita* or *Phlegm* which takes away their Appetite. Beſides this ſtrange Body, which was naturally Clammy, there was a Ball, or glewy Bowl, but eaſily ſeparable : It was of an Oval Figure, containing thirteen lines to ten. One of theſe ends was as it were cut, and this cut had a ſlight Cavity through the middle. This Ball was of a dark Olive-Colour. *Velſchius* in his Treatiſe of the Balls which are found in the Ventricle of the *Chamois*, calls them *German Bezoar*. *Cardan* ſtiles them *Cows-Eggs*, by reaſon perhaps that theſe Balls are ſometimes found in the Ventricles of young *Cows*, which has been obſerved by *Pliny*. *Bartholinus* ſays that they are frequently found in *Denmark* in the Bellys of *Horſes* and *Sheep*. He thinks that theſe Balls are made, either of the Hair which the *Cows* do ſwallow in licking themſelves, or from the Wooll which the *Sheep* do eat from each other, when they do paſs away the Winter in Snowie Mountains, where they can find no Graſs.

The *Ball* which we found ſeemed not to be compoſed of Hairs, but of lignous Fibres : which was diſcovered by the inequality of theſe Fibres which were not of the ſame ſize, nor of an uniform Figure like as are Hairs. It muſt be likewiſe conſidered that theſe Balls are found in the Bellies of *Horſes*, which are not Animals that do lick themſelves, and in which they muſt be made of ſomething elſe than Hair. Thus the generality of Authors, and amongſt others *Camerarius* and *Geſner*, do think that theſe Balls are compoſed of the reſidue of the Plants which the Animals have eaten, the hardeſt Fibres of which are undigeſted; and they do ſay that theſe Fibres are of the Plant *Doronicum* which ſome do judge to be a kind of *Aconite*: for tho' the leaves of the *Doronicum* be tender and ſoft, they have ſome nervous Fibres, almoſt like *Plantain*. *Pliny* ſeems to confirm this Opinion, when he averrs that the *Chamois* do's live on Poiſon as well as *Quails*: for tho *Botanniſts* are not agreed upon the poyſon of the *Doronicum*, and ſome do queſtion whether it is poiſon to Men, yet they do concurr that it is poiſon to moſt Beaſts. It is thought that the *Chamois* does eat the *Doronicum*, to ſecure it ſelf from the *Vertigo*, to which they might be ſubject when they do run upon the points of the high Rocks. *Velſchius* aſſerts that theſe Balls are found only in the firſt, or ſecond *Ventricle*: that which we found was in the third. *Camerarius* remarks that it is toward the Month of *November* that they grow there: our Diſſection was made in *December*.

All the *Inteſtines* together, without comprehending the *Cæcum*, were forty foot long. The *Cæcum* was eight inches. The *Colon* exceeded not a foot.

The *Spleen* was round and flat like a Cake; it was eight lines thick in that half which adhered to the great *Ventricle*; the other half, which was not adherent, went leſſening its thickneſs to the end which was very thin.

The *Liver* had three Lobes, two great ones and a little one. The *Gall-Bladder* was in the middle of the right Lobe. Amongſt the Animals that have no Gall, *Pliny* ranks the *Goat*, of which the *Chamois* is a Species. That which *Bartholine* Diſſected had none.

The *Kidneys* were two inches long. The *Membrana Adipoſa* was not joyned and faſtned as uſually upon the body of the Kidney, but it left a vacant ſpace between both. The ſame thing has been obſerved by *Bartholine* in his *Chamois*. The top of the *Membrana Adipoſa* of the right Kidney was faſtned to the little Lobe of the Liver.

The *Cornua Uteri* were extraordinary long, and bent with ſeveral Folds and Circumvolutions. The *Teſticles* were joyned to the extremity of the *Cornua*, which are properly the *Uterus* of Brutes. The *Vaſa præparantia* did caſt forth ſome Branches, not only into the Teſticle and Matrix, but likewiſe into the Bladder. The round Ligaments took their Origine at the ſides of the Matrix or *Ductus*, and did deſcend as is uſual into the Groin where they were dilated to make that which is called the *Gooſe*'s foot.

The *Lungs* had eight Lobes, four on the right ſide, three on the left, and the eighth on the inſide of the duplicature of the *Mediaſtinum*.

The *Heart* was long and pointed. Towards the point there was a callous, white, hard, and round *Apophyſis*: it proceeded out of the heart about the bigneſs of ones little fingers end.

The *Brain* was large in proportion to the Body, containing two inches in breadth and three in length, comprehending the *Cerebellum*, The Anfractuoſities were more and more diverſified than they commonly are in Brutes. Although the *Cerebrum* was divided into the right and left, by a long cavity as is uſual, yet there was no production of the *dura Mater*, to make that which is called the *Falx*; there was only a line very little elevated, which anſwered to the cavity of the Brain. The *Choroides* was very much dilated by the affluence of the Blood, which had been retained in the Veſſels whereof it is compoſed. The *Glandula Pinealis* was large, containing a line in Diameter. Its Figure was rounder than ordinary.

The *Optick Nerve* did enter into the Globe of the Eye out of the *Axis*, a great deal more towards the Brow than towards the Jaw. On the inſide of the Globe of the Eye, it entred through the extremity of the *Tapetum*, which was brown of Colour.

The *Cryſtallinus* was more convex on the outſide than on the inſide. It was naturally divided in three on the Superficies of its interiour part. The *Membrana Arachnoides* was very thick and hard, ſo that it was eaſily ſeparated from the *Cryſtallinus*.

The Explanation of the Figure of the Porcupine *and* Hedgehog.

THE lower Figure repreſents the difference of theſe two Species of Amals, which are unlike not only in their ſize, but alſo in their prickles, which are all of one ſort in the *Hedge-hog*, and much ſhorter, in proportion to the Body, than in the *Porcupine*, which has great and hard prickles on the Back and Flancks, and which on its Neck, Head, and ſides of its Jaws has only long, ſmall, and flexible Briſtle.

In the Upper Figure.

A. *The* Ventricle *of the* Porcupine.
B. *The* Duodenum, *which may paſs for a fourth* Ventricle.
C. *The great* Spleen.
D. *The little* Spleen, *which is faſtned on the Ventricle by its middle, and joyned by its lower end to the* Ilium *towards E.*
E F G. *The* Ilium.
H. *The* Cæcum.
I I. *The* Colon.
K. *The external* Ear *like to that of a* Man's.
L. *One of the* Porcupines *great* Teeth, *as big as the* Life.
M M. *The* Paraſtatæ.
N N. *The* Teſticles *of the Male*-Porcupine.
O O. *The* Proſtatæ.
P. *The* Bladder.
q q. *The Ligaments which do faſten* Teſticles, *and paſs into the Thighs.*
r. *The* Epididymis *naturally ſeparated from the Teſticle.*
Q Q. *A piece of the Skin which ſeemed as it were Printed on the inſide by reaſon that it is wrinckled in ſmall Cavities Lozenge-wiſe. There is likewiſe one of the* Porcupine's *prickles which was left faſtned to this piece of Skin, to ſhew how little adherent it is, becauſe of the ſmallneſs of its root, which penetrates not far into the Skin.*
R. *One of the Quills which were upon the* Porcupine's *Rump.*
S S. *The* Kidneys.
T. *The right* Succenturiatus *immediately faſtned to the* Vena Cava *and* Emulgens.
U. *The left* Succenturiatus *immediately faſtned to the great* Kidney, *and by the means of a Veſſel to the* Emulgent.
X X. *The two* Cornua Uteri.
Y Y. *The* Teſticles *of the Female* Porcupine.
Z. *The* Bladder.
Φ Φ. *The broad Ligament of the* Uterus.
Γ. *The left* Succenturiatus *cut in half.*
Δ Δ. *The* Teſticles *of the Male*-Hedg-Hog. *incloſed within the Belly, as they commonly are in the Females of other Animals.*
α α. *The* Epididymis.
β β. *The* Paraſtatæ.
γ γ. *The* Proſtatæ.
ε ε. *Some fleſhie Membranes which do ſerve for* Cremaſters.
ξ. *A Tranſparent Membrane.*
Θ. *The* Bladder.
Ω Ω. *Membranes in the Male* Hedg-Hog *like the broad* Ligaments *of the* Uterus. *Theſe Membranes are thick and very different from the Membrane ξ, which is Tranſparent.*
Π θ θ. *The* Vaſa Spermatica præparantia.
Λ Λ. *The Tongue of the* Porcupine.

THE
ANATOMICAL DESCRIPTION
OF SIX
PORCUPINES
AND TWO
HEDGE-HOGS.

THE *Porcupine* and *Hedg-Hog*, according to the Ancients, are Animals of one *Genus*, by reaſon of the Prickles wherewith they are both covered. The name of the *Genus* is ἐχῖνος, *Echinus.* The *Porcupine* is by the *Greeks* and *Latins* called *Hyſtrix.* The *Hedg-hog* is by *Oppian* Stiled βαιὸς ἐχῖνος in *Greek*, *minor Echinus* in *Latine*, as if the whole diſtinction of theſe two Species conſiſted in only the difference of the ſize. Yet we have obſerved that the Animals of theſe two Species were likewiſe different in other things more eſſential, namely, in the Country where they do breed, in their Prickles, and in the Shape of the reſt of their Body: for the *Porcupine* is bred in *Africa*, the *Hedge-hog* is common in *Europe*; the prickles of our *Hedge-hogs* were ſhorter in proportion to their Body than thoſe of the *Porcupines*; and the ſhape, as well as the uſe of theſe prickles, was alſo very different, even as their Feet, Noſe, and all the inward parts.

The greateſt of the ſix *Porcupines* which we here deſcribe, was eighteen inches from the Noſe to the extremity of the hind-feet extended. They all had over the Body a Briſtle or great ſhining Hair, reſembling in its groſſeneſs Conſiſtence, Figure, and Colour, the Briſtles of a *Boar*; which has given to this Animal the Appellation of *Hyſtrix*, which comes from ὑὸς θρὶξ that is to ſay *Hogs-hair*. And indeed this Briſtle did better reſemble that of the *Hogg* than of the *Boar*, in that it was not intermix'd with another ſhorter Hair, like to the downe which garniſhes the root of the Briſtle of the *Boar*; but it was every where of the ſame length and kind. It was above three inches long all over the Body, except the top of the Neck, where it was a foot long, and three times as big as any where elſe. Theſe Briſtles made as it were a tuft on the Head, of about eight inches, and muſtaches about ſix inches long. The Briſtles of this tuft was of a dark Cheſnut Colour from the middle to the end.

Beſides theſe Briſtles there was likewiſe on the Back two ſorts, of Prickles ſome ſtronger, thicker, ſhorter, and more pointed, the points whereof were keen, with two edges like an awle. *Claudian* puts theſe ſorts of prickles on the head of the *Porcupine*, and ſays that they do ſupply the place of Horns: which we found not in our Subjects. The other prickles were a great deal longer and more flexible: they were a foot long, their points flatted, and weaker than the others. The ſhorteſt and ſtrongeſt were white toward the root, and of a dark Cheſnut Colour at the end. The longeſt were white at the root and end; and in the middle they were chequered with black and white. All theſe Hairs and prickles were hard and ſhining in their ſurface: the inſide was of a Subſtance white and ſpongious.

There was likewiſe another kind of prickles the end of which ſeemed to have been cut, the reſt being hollow like a quill; but that which compoſed this Tube was a great deal thinner than that of any quill. Theſe Tubes or hollow Pipes exceeded a line in Diameter, and were three inches long: they were white and tranſparent like Pens, and rayed with little wrinckles long-ways. They were twelve in number, and laid upon the extremity of the *Coccyx*, ſomewhat raiſed at the top. Their root was very ſmall, not exceeding the bigneſs of a Pin, although it was above ſix lines long.

Thoſe prickles which were ſtrongeſt and ſhorteſt, were eaſie to pluck out of the Skin, not being firmly fixed like the others: theſe the Animals are uſed to dart againſt the Hunters by ſhaking their Skin as *Dogs* do when they come out of the water. *Claudian* ſays elegantly that the *Porcupine* is himſelf the *Bow*, the *Quiver*, and the *Arrow* which he makes uſe of againſt the Hunters.

The *Fore-feet* had but four toes; the hind-ones had five, and were formed like thoſe of a *Bear*, the great toe being outward. The whole Leg and Foot, as alſo the Belly, was covered with the great Briſtles already mentioned, having only the ſole unprovided thereof. Theſe feet reſembled not thoſe of a *Hog*, as *Albertus* reports they do. We found likewiſe that the Noſe of our *Porcupine* was not made like the Snout of an *Hog*, as it is repreſented by *Claudian*, to whom nevertheleſs the *Porcupine* muſt be well known, being born in *Ægypt*, where this Animal is very common. This Noſe reſembled that of an *Hare*, the upper Lip being cleft: the lower was likewiſe pierced, and made as it were a Caſe, in which were ſhut up the two *Inciſores* of the lower Jaw. Theſe Teeth as well as thoſe of the upper Jaw were not unlike thoſe of the *Caſtor*, being very long, and ſituated in ſuch a manner that the keen part of the lower ones did not meet the cutting part of the upper ones, like a pair of Pincers, as in moſt Animals: but theſe parts did paſs over each other like Ciſſars. The *Molares* in four of our Subjects were only ſix in each Jaw; the fifth had eight. They were ſhort, ſtanding not above a line and a half out of the Jaw-bone. They were cut at the top very ſmooth. By their cutting it appeared that they were not intirely ſolid, but that the Bone was as it were folded or leaved, having amongſt the folds of the Bony Subſtance another blackiſh and Spongie one. Theſe Folds were not only in the ſurface where they appeared, but they were through the whole Tooth, as was found after it was broken.

The *Tongue* was at its extremity covered over with ſeveral little bony Bodies like Teeth. The greateſt were a line in breadth: their extremity was keen and divided by three rays or cuts, which made as it were four *Inciſores*.

The *Ears* were thinly covered with a very ſoft Hair: they reſembled thoſe of Man. In one of our Subjects they were found different in the upper part, which was pointed as the Ears of *Satyrs* are painted.

The *Eyes* were little as in the *Hog*, not exceeding four lines from one corner to the other. The Situation of the corners of this Eye was very extraordinary, the great *Canthus* being much higher than the leſſer.

Directly over the *Os Pubis* near the *Anus*, there was a tumour or ſwelling about the bigneſs of an Egg without Hair and Prickles. In the middle of this tumour, and near the *Anus*, there was a little hole leſs than that of the *Anus*. *Albertus* reports that the *Porcupine* has two *Anus*'s, by reaſon perhaps of this ſecond Aperture, which is deſigned for the Parts of Generation, which are not externally different in the two Sexes, almoſt as it is in the *Civet-Cat* and *Caſtor*, the *Penis* of the Male being concealed in the Pouch, which was made to come out through the hole adjoyning to the *Anus*, when the Pouch was preſſed.

The Skin being flead, on its internal ſurface appeared ſeveral wrinckles, Lozenge-wiſe, about two lines in bigneſs. The whole skin over the Back, and Flancks, was adherent to the *Muſculus carnoſus*, which was ſtrong and fleſhie, eſpecially along the Back, at the place where the ſtrong prickles are faſtned. This Membranous Muſcle had its Origine at the tranſverſe and oblique *Apophyſes* of the *Vertebræ* of the Neck. From thence it was extended along the *Vertebræ* of the Back, and inſerted it ſelf into the *Oſſa innominata* being by the way faſtned to the *Vertebræ* of the *Spine*. It was very adherent, not only to the skin, as has been already declared, but likewiſe to the common Membrane of the Muſcles. On the internal ſurface of this Muſcle there was a great company of Nerves which were laid and interwoven like a Net. The skin was not only ſtirred by theſe Muſcles, as it is in the generality of Brutes, but it had likewiſe four others on each ſide ſeparately to remove different places of the skin, as the great skinnie Muſcle is to remove the whole skin. Theſe four Muſcles proceeded from the Intercoſtals, where they had a large *baſis*, which terminated on a little Tendon, like to the treble of a Lute. The Tendons of theſe four Muſcles were inſerted into the skin which covers the Ribs and Flanks.

The *Cartilago Xiphoides* was extraordinary large. The *Epiploon* which deſcended on the left ſide to the Groin, was firmly fixed in this place to the *Peritonæum*, and did not freely flow over the Inteſtines as uſually. In one of the Subjects it adhered to the Bladder.

The *Ventricle* was almoſt round, although divided into three unequal Pouches. The middle one, which was the greateſt, deſcended lower than the others. The ſuperiour Orifice was very ſtrait. It was in the middle, and directly over the great Pouch. The inferiour Orifice was mightily dilated, being an inch and a half broad; ſo that the *Duodenum* ſeemed to be a fourth Ventricle joyned to three Pouches, which did repreſent three others: but this Inteſtine was contracted to make the *Jejunum*; which was very ſhort, and the *Ileum* yet more. The *Cæcum* was very large: It was ſeven inches long and two broad towards the *Ileum*, terminating in a point, and making in its whole length the Figure of a Sythe. It had three Ligaments correſpondent to its length, which did contract it, and make Cells as in the *Colon* of *Man*. The Ligament that was in the bending which this Inteſtine made, was very large; 'twas a part of the Meſentery, but was faſtened to the Inteſtine only by one ſide; the reſt was looſe. The *Colon* had likewiſe ſome Cells, which were not ſo well ſeen as thoſe of the *Cæcum*, although there were two Ligaments to form them. This Inteſtine was ſtrait: It was forty inches long; It was folded in two, and the two parts were ſtrongly faſtned to each other throughout their whole length.

The *Liver* was ſuſpended and hung upon the *Diaphragme*, by a very large and Membranous Ligament, which proceeded from the *Cartilago Xiphoides*, and vertically deſcending, was inſerted from the Fiſſure of the Liver to the middle of its gibbous part. It had ſeven Lobes, four great ones, two on each ſide of the Fiſſure, and three ſmall ones, one of which was in the middle of the Fiſſure, faſtned by a Membrane to the *Vena Cava*; the third was underneath, between the four great ones. The two great Lobes of the left ſide were joyned together at their extremity by a very ſtrong Membrane.

The *Gall-Bladder* was ſmall, flat, and almoſt empty.

The *Pancreas* was very large being three inches and a half long, and ſix lines broad at the wideſt place.

The *Spleen* was different in our Subjects. There was one in which we found two Spleens. The largeſt, which was five inches long and ten lines broad, was faſtned to the left ſide of the Ventricle, by the *rami Splenici* which do make the *Vas breve*: it was alſo faſtned to the *Epiploon*. The other Spleen which was three inches in length and eight lines in breadth, was fixed to the Ventricle, without the appearance of any Veſſels which did unite it. It was likewiſe joyned to the *Epiploon* by the upper end, and to the *Ileum* by the lower end. In the other Subjects, where it was ſingle as is uſual, it was ſeven inches long and ten lines broad. It was immediately fixed by its upper end to the upper part of the Ventricle, and by its hollow part to the left ſide of the Ventricle, by the means of the *rami Splenici*, which ſhot forth three branches into the Ventricle, and as many into the Spleen. The Ramifications which went to the Ventricle were three inches long: thoſe of the Spleen were only one. In one of our Subjects the Spleen, beſides the Ligaments of of the *Vas breve*, and of the Membranes by which it was held to the Ventricle and *Epiploon*, had alſo a Ligament which did hang it to the *Diaphragme*. In all our Subjects the Spleen was of a very dark red, eſpecially in its hollow part which regards the Ventricle, where it was almoſt black.

The *Kidneys* were double on each ſide, having a *Succenturiatus* a third part as big as the true Kidney. The true Kidney was two inches in length and one in breadth. It was very ſolid, not having any Cavity for the *Pelvis*. It had only on the outſide a Cavity or depreſſion in its anteriour part. The *Parenchyma* of the *Succenturiatus* was very different from that of the true Kidney, being more ſoft; It was likewiſe compoſed of two different Subſtances *viz.* the one fleſhie and red, as in the true Kidney; the other glandulous and whitiſh; theſe two Subſtances were mixed together, ſo that this Kidney being cut, did ſhew as it were ſeveral rays which went from the Circumference to the Center, almoſt after the ſame manner as it is ſeen in the *Cerebellum* of *Man.* At the Center of this Kidney there was a Cavity capable of containing a midling Bean. The *Vaſa Emulgentia* made an acute Angle with the Truncks of the *Cava* and *Aorta*, having their Origines much higher than the Kidneys, which ſeemed drawn downwards.

The *Bladder* was very large and thick, being compoſed of two Coats, which included between them a ſubſtance ſpongious and ſomewhat fleſhie. In one of the Subjects, as it has been already declared, all the back part of it adhered to the inferiour part of the *Epiploon*, on which it was laid. The fore-part, which touched the *Peritonæum*, was leſs fleſhie. It was looſe in this place without being joyned to the *Peritonæum*.

The *Teſticles* of the Males were long and narrow, containing only four lines in breadth and an inch and half in length. The *Vaſa Præparantia* were faſtned to the inferiour part of the Teſticle, and did form an *Epididymis* ſeparated from the Teſticle. This *Epididymis* was faſtned to a Ligament, which paſſing into the Thighs, did ſeem to be made to ſtrengthen the Teſticle, and perform the Office attributed to the round Ligament of the *Uterus.*

The *Paraſtatæ* were extraordinary great: they were two inches and a half long, and ſeparated into three branches; and in ſome of our Subjects into five, like branches of *Coral.* At the end of the *Penis* there was a bone of an inch long.

In the Females the broad Ligament of the *Matrix* was ſtrongly faſtened to the Kidneys at the baſtard-Ribs. The Teſticles were of a Glandulous Subſtance, without any appearance of Bladders or Eggs.

The Nervous Center of the *Diaphragme* was ſo thin and tranſparent, that the Lungs were ſeen through. There were five principal Lobes, which were each divided into two. The Rings of the *Aſpera Arteria* were not intire. The Trunck of the *Arteria Venoſa* and its chief branches were of an extraordinary length. Having tied the *Azygos* in one of our Subjects, and put a ſmall pipe underneath the Ligature, when it was blown, the *Vena Cava* ſwelled, beginning to ſwell through the *Iliaca*, by reaſon of the Communication of one branch of the *Azygos*, which paſſing beyond the *Diaphragme* went to make an *Anaſtomoſis* with one of the the branches of the *Iliack.*

The *Heart* was two inches in length from the *Baſis* to the point, and fourteen lines in breadth through its middle between the point and the *Baſis*, being ſomewhat larger in this place than at the *Baſis*: it was blunt at the end and the fleſh of the left Ventricle was firm and hard. It had an Eminence which made it to appear winding like a Screw. The right *Auricle* ſeemed to be only a dilatation of the *Cava.* In one of the Subjects the two Auricles of the Heart were filled with a ſlimy, white, and very ſolid Subſtance, and the Ventricles with a black and congealed blood.

The *Brain* was almoſt like that of the *Hog.* There was no bone between the *Cerebrum* and *Cerebellum.*

The *Globe* of the *Eye* exceeded not four inches Diameter: it was almoſt Sphærical. The *Cornea* was elevated like a demi-globe on another Globe formed by the *Sclerotica.* The *Cryſtalline* was likewiſe almoſt ſpherical in one of the Subjects, being more convex before than behind. In this ſame Subject, the *Cryſtalline* had as it were a Kernel, its internal part being hard after the manner of a Cartilage, and not leſs tranſparent than the reſt. This Part thus hardened had not the Figure ſpherical like the whole Cryſtalline, but it was flat and lenticular. The optick Nerve entered at the middle of the Globe of the Eye. The *Uvea* was of a dark red; the Membrane which is applyed to the bottom of the Eye, and which we do call the *Tapetum*, was whitiſh, and diſſeminated with ſeveral little red Spots. This whitiſh Colour of the *Tapetum* made the hole of the *Uvea* to appear leſs brown than the *Iris.*

The two *Hedg-hoggs* which we diſſected were Male and Female, they contained eight Inches from the Snowt to the end of the hind-feet extended, which were not above two Inches. The Noſe in both was ſhort and round, better reſembling the Noſe of a *Dog*, than the Snowt of a *Swine*; ſo that they were of that Species of *Hedg-hog* called by *Mathiolus Canina*, who makes two, *viz.* one which partakes of the *Dog*, and the other of the *Hog*; and this kind ſeems to be more common than the other, becauſe that in *Engliſh*, the *Heriſſon* is abſolutely called *Hedg-hog*, and in *Dutch*, *Een yſere Verken*, that is to ſay, a *Hog* covered and armed with *Prickles.*

They both had the Head, Back, and Flancks covered with Prikles. The Noſe, Throat, Belly, and Feet were only interſperſed with a very ſmall and very white Hair. *Hermolaus* ſays that the *Hedg-hog* has Prickles all over the Body, except on the Noſe and Paws; but we found this falſe in one of our Subjects, which had no prickls on the belly; but thoſe on the Back and ſides when it was heaped round, the Breech and Snowt approaching each other, did intirely cover the Belly.

The whole Animal was of one Colour; the Skin, Hair, and Prickcles being of a dark yellowiſh Gray. The Prickles were an Inch and a half long, and very different from thoſe of the *Porcupine*; for they were ſomewhat flattiſh, and very like to the Prickles of the outward Shells of *CheſNuts.*

The Paws were compoſed of five Toes, of which there were three great ones in the middle, and two little ones, one on each ſide. They had long, pointed and hollow Claws, making the Figure of a Pen.

The *Teeth* were diſpoſed in ſuch a manner, that below there was only the *Molares* and *Inciſores.* Theſe laſt were but two, which were ſomewhat longer than the *Molares.* At the top there were no *Inciſores*, but only two *Canini*, which left a vacancy in which the *Inciſores* of the lower Jaw were lodged. The *Canini* which were longer than the *Inciſores*, had each alſo a place to lye in, in the lower Jaw, between the *Canini* and *Inciſores*, with an Interval for that purpoſe.

The Female had eight Teats, four on each ſide, diſpoſed in two ranges along the Belly and Breaſt, the two higheſt being ſeated on the Pectoral Muſcle.

Having taken off the Skin, there appeared a *Muſculus Carnoſus*, which as in the *Porcupine* was extended from the *Oſſa Innominata* to the Ear and Noſe, running along the Back-bone without being faſtned thereunto; which ſhews that this Muſcle ſerves not the *Hedg-hog* for the ſhaking his Skin like the *Porcupine*, which darts his Prickles by this Action, but to bring its Head to its

Breech, and to gather up the whole Body like a Ball; which the *Hedge-Hog* uſes to do when it cannot ſave it ſelf by flight: for being in this poſture it is all over covered with its Prickles, and the *Dogs* know not how to take him without being Pricked. *Pliny* reports that if notwithſtanding this Præcaution, he perceives himſelf in danger, he let's fly his Urine, which he knows to have the quality of vitiating his Skin, and making all his Prickles to fall off, as it were to deprive the Hunters of the Principal Fruit of their Labour, which is this Skin, which the Ancients had in great eſteem, by reaſon that it ſerved them for Bruſhes to clean their Cloaths.

The *Liver* had ſeven Lobes, one of which was divided in two. The Gall-Bladder was in the middle of the two upper Lobes, which were the greateſt. Its Forme was Ovale. It was eight Lines long, very full and Blewiſh.

The *Venæ Lacteæ* were White and very apparent in the *Meſentery*; and the Receptacle of the Chyle was great, ample, and full.

The *Spleen* was layd on the Ventricle, to which it was faſtned, by twelve branches from the *Vas Breve*. It was long and cut like a *Cock's* Comb. The *Pancreas* to which it was faſtned, had the ſame Forme: It differed therfrom only in Colour, the *Pancreas* being Whitiſh, and the Spleen of a Blackiſh Red.

The *Inteſtines* were all alike in Subſtance and thickneſs. There was no *Cæcum*. They contained all together four Feet in length.

The Kidneys were an inch long and eight Lines broad. They were of an Olive Colour, the right being ſituated higher that the left.

The *Bladder* was an inch and a half long and an inch broad.

In the Male the *Teſticles* were in the Belly; which, according to *Ariſtotle*, is peculiar to the *Hedg-Hog*, which amongſt all Quadrupeds that do ingender a perfect and living Animal, is the only one whoſe Teſticles are incloſed in it,as in Birds. Theſe Teſticles had a very larg *Epididymis*, which received the *Vaſa Spermatica Præparantia* divided into four Branches, and which were ſeparately inſerted into them from the baſis to the greater half of their length. This *Epididymis* was not ſeparate from the Teſticle,as in the *Porcupine*,but was therto faſtned, all its length. The *Vaſa Spermatica Deferentia* proceeded from the top of the *Epididymis*. The Teſticle and its Veſſels were tyed and ſuſpended by a Ligament which might paſſe for a *Cremaſter*, becauſe that it was a Membrane which appeared ſomewhat Fleſhy near the Teſticle. The reſt of this Membrane was extended and inlarged after the manner of the broad Ligaments of the *Uterus*. It had a great many Veſſels of which two of the cheif did make a very conſiderable *Anaſtomoſis*, by croſſing one another in the middle. They proceeded from the *Vaſa Spermatica Præparantia*, as from their Trunck, and were diſtributed through this whole Membrane, extended like the Wings of a *Batt*,as in the *Uterus*; ſo that conſidering the greatneſs and Number of theſe Veſſels, which were not proportionate to the quantitie of the Nouriſhment which the Membrane might require, it might be probably thought that the uſe of this Structure was, that the *Arteria Spermatica* might ſend to this Membrane a part of the bloud which it carryes to the Teſticle, to be prepared in this great Number of branches; in which the remainder that cannot be imployed to the Nouriſhment of the Membrane ſeemed to be ſometime retained, and perfected by this long retention, to be inabled afterwards to reflow into the Trunck of the *Spermatick Artery*, and to mingle with the bloud which go's into the Teſticle; there being nothing to oppoſe this reflux, of which it is neceſſary to ſuppoſe the liberty into all the Arteries, which upon this account are deſtitute of the Valves which are found in the Veins: and the compreſſion that the motion of Reſpiration cauſes to all the *Viſcera*, being a ſufficient impulſive cauſe for this reflux.

On both ſides of the Neck of the Bladder there were Pouches of a Subſtance partly Glandulous, partly Membranous. They were very Yellow: T'was apparently the *Paraſtatæ*. The *Proſtatæ* were a little underneath, of an extraordinary ſize, even as the *Paraſtatæ*.

In the Female the *Uterus* was compoſed of a Neck and two Hornes. The Neck was compoſed of two Membranes: the external was thick and Fleſhy, the internal was thinne, Membranous, and Nervous. The Hornes were unequal, the left being leſſer than the right, in which there was a *Fœtus*.

The *Lungs* had five Lobes, *viz.* three of a middle ſize at the right ſide, and two on the left, one of which was greater and the other leſſer than all the reſt. This little one, which the Cavitie of the Mediaſtine incloſed, was forked at the end. The *Heart* was almoſt round. The right *Auricle* was of a Red almoſt Black. The left was whitiſh.

The Globe of the Eye exceeded not two lines in diameter: it had an internal Eyelidd. Of the three Humours of the Eye there appeared only the *Cryſtalline*, which filled up the whole Globe, without any appearance of the *Aqueous* or *Vitreous* Humour. The *Retina* did immediately touch the *Cryſtalline*, and as it were ſtick to it on that ſide towards the bottom of the Eye, as the *Cornea* did cover and touch it before. The *Uvea* was all over black, without the *Tapetum*; it did not likewiſe make any fold on the fore-part to forme the *Iris*; ſo that the Eye, when the lidds were open, did appear all Black.

THE

The Explication of the Figure of two Sapajous *and two other* Monkeys.

THe lower Figure ſhowes how the Hands and Feet of the *Ape* do differ from the Hands and Feet of Man, the thumb of the Hand being ſmall and the great Toe of the Foot very large, and the other Toes extraordinary long. Here is not deſcribed the Figure of the fourth *Ape*, which is the ſecond *Sapajou*, becauſe that it was wholy like to that which is here repreſented, except the Noſe, which was longer.

In the Upper Figure.

A. *The* Umbilical *Veine.*
B B. *The two right* Lobes *of the* Liver.
C C. *The two left* Lobes *of the* Liver.
D. *The fifth, Cleft and making as it were two Leaves.*
E. *The* Gall-Bladder.
F. *The* Ductus Cyſticus.
G G G. *The three* Ductus Hepatici.
4. 5. 6. *Three Branches that come out of the firſt.*
H. *The common* Ductus.
I. *The* Ventricle.
K. *The* Spleen.
L. *The* Pancreas.
M. *The* Cæcum.
N. *The end of the* Ileum.
O. *The beginning of the* Colon.
P. *A Gland faſtned to the lower part of the Trunk of the* Cava.
Q Q. *Two other Glands faſtned to the two* Iliack Veines.
R R. *The* Teſticles.
S S. *The Glandulous* Proſtates.
Θ. *The* Bladder *ſo turned upſide down as to hide the* Penis.
T T. *The Brain.*
t t. *The back part of the Brain without Anfractuoſitys.*
V. *The* Bladder *in the Natural ſituation, and opned to ſhew the Caruncle* Y *and the thickneſs of the* Proſtates 3. 3.
X X. *The* Paraſtatæ Cyrſoides.
Y. *The Caruncle at the beginning of the* Urethra.
3 3. *The Glandulous* Proſtates *which look but like the thickning of the Neck of the* Bladder.

THE
ANATOMICAL DESCRIPTION
OF TWO
SAPAJOUS
AND TWO OTHER
MONKEYS.

THE Species of *Apes*, are very numerous. *Pliny* reduces them under two *Genus's*, viz. thoſe which have Tails, and thoſe which have none. The Tail-leſs *Ape* is by the *Latines* ſimply called *Simia*. Thoſe which have a Tail are of two Species. The Latines have borrowed of the Greeks the names which they do give them: for ſome are called *Cercopitheci*, from the name of the *Genus*, that is to ſay, Tailed-*Apes*; others *Cynocephali* that is to ſay, which have a head like a *Dog*, by reaſon of the length of their Noſe. The differences of *Apes* are taken in French, principally from their ſize; for the great ones are ſimply called *Singes* or *Apes*, whether they have a Tail or no; or whether they have a long Noſe like a *Dog*, or a ſhort one; and the little *Apes* are called *Guenons* or *Monkeys*.

The four *Apes* which we deſcribe were of the *Genus* of the *Cercopitheci*, becauſe that they had Tails. But their ſmalneſs permitts them to be ranged only under the *Genus* of *Monkees*.

They were but fourteen inches from the Crown of the Head to the begining of the Tail, which was twenty inches; The Arm had four inches; from the Elbow to the end of the fingers, was ſix inches: the Thigh four and a halfe: the Leg five, and the Foot four, from the Heel to the end of the longeſt Toe. They did likewiſe all agree in ſeveral other things; which are common almoſt to all *Apes*. viz. 1. That they had Hairs on each Eye-lid, which *Ariſtole* has obſerved to be peculiar to the *Ape*, among the *Quadrupeds*. Theſe Haires according to *Ariſtotle's* obſervation, were ſo fine that it was hard to deſcern them.

2. That in the lower Jaw there was a Pouch or Sack on each ſide into

which theſe Animals uſed to put what they would keep. 3. That the Teeth were very white, and like Man's, except the *Canini*, which were very long in the upper Jaw, and very ſtrait in the lower Jaw, being without Point and differing from the *Inciſores*, only in their being ſtraiter and longer. 4. That the Feet were almoſt like the Hands, as they generally are in other Brutes, the Toes of the Feet being as long as thoſe of the Hands; which is not in Man, whoſe Toes are two thirds ſhorter than his Fingers. The Feet of our *Apes* did indeed more reſemble the Hands of Man than their own, by reaſon of the conformation of the great Toe, which reſembled a Thumb, being long, ſlender, and a great way parted from the firſt Finger; whereas in the Hand or Paw, the Thumb was ſo ſhort, and ſo cloſe to the firſt Finger, that it ſeemed almoſt uſeleſs. 5. That the Parts of generation in three of our Subjects, which were Males, were different from thoſe of Man, there being no *Scrotum* in two of theſe Subjects, and the Teſticles not appearing by reaſon that they were hid in the fold of the Groyne. It is true that the third, which was one of the *Sapajous*, had a *Scrotum*, but it was ſo ſhrunk, that it did not appear. 6. That the Skin ſtuck cloſe on the Buttocks.

The three Males differed only in Colour of their Hair. The fourth Subject, which was a Female was of the *Cynocephali* kind; not having a flat Face like the others, but a Noſe ſomewhat long like little *Bolonia Dogs*. Yet its long Tail did make it to be of the *Cercopitheci* kind like the others, whoſe differences amongſt the Ancients were taken from the Colour of the Hair; the *Cercopitheci* ſimply called, being thoſe which have but one Colour; and thoſe which have ſeveral being called *Cepi*, that is to ſay Gardens, by reaſon of the diverſity of Colours wherewith they ſeem to be flowered and Imbroidered, as *Ælian* reports *Pythagoras* to have ſayd.

The firſt of our *Apes* was of the firſt Species of the *Cercopitheci*, being all of one Colour, *viz.* of a Red ſomewhat inclining to aGreen. This colour which was predominant, was only a little darker on the Back, and lighter on the Breaſt and Belly.

The ſecond was of the ſecond Species, becauſe that beſides the Greeniſh-Red colour of the Hair which covered the Back, the Hair which adorned the Belly, Breaſt, and inſide of the Thighs and Arms wasGray.

The third and fourth were likewiſe more diverſified with Colours: This Species is called *Sapajou*. Theſe two Subjects were different, not only in colour and the various ſhape of their Spots, but alſo in the Forme of their Noſe, which was long in the one, and flat in the other. The firſt, which was a Male, was white on the Belly, Stomach, Throat, on the inſide of the Armes and Thighs, and on the Buttocks. All the Back from the *Omoplatæ* to the Tail, was of a dark-Red. The Flanks, the outſide of the Armes and Thighs, the Leggs and Crown of the Head were Black, and every black Hair had alſo little Red and White Spots, there being two Red Spots towards the end, and the half towards the root being white. On the Chin there was a white Picked Beard, an inch long. The Hair on the Back was an inch in length; about the Neck an inch and a halfe; it was in this place more Staring than in the reſt of the Body, and made as it were a Ruffe. The Brow had a White liſt, on which a row of Black Hair was elevated like Eye-Brows. The *Iris* in the Eyes was of a Rediſh Yellow. The *Pupilla* was very large.

The Head was round, with a kind of a flat Face, reſembling the Viſage of a Man with a ſhort and Flat Noſe.

The other *Sapajou*, which was a Female, had the Noſe long inclining to the *Cynocephali*. Its Hair was of three colours, *viz.* Red, Gray, and a dark Cheſt-Nut. The Belly and Breaſt were mixt with Red and Gray. The Armes and Leggs were of a dark Cheſtnutt; the Back had the Cheſtnut and Red mixt together; ſo that in ſome places there was more Red, in others more Cheſtnut; which made great Spots almoſt as in *Cats*. It had neither the White on the Fore-head nor the Beard, as the other *Sapajou*.

The *Ears* of the firſt *Sapajou* were round, and ſo ſmall, that round the hole they were not extended above a line and a half, being intirely covered with the Hair. The Writers of Phyſiognomie, have thereon apparently Founded the Judgement which they do make of little round Ears, which they do put as a ſign of a deceitful and Villanous temper, ſuch as is the *Apes*.

Authors do not agree touching the internal parts of the *Ape*. *Ariſtotle*, *Pliny* and *Galen* do averr that they are wholly like to thoſe of Man. *Albertus* do's on the contrary affirm, that as much as *Apes* are like to Man on the outſide, ſo much are they unlike in the inſide: So that there is no Animal, as he ſayes, which has the intrails ſo different from Mans as the *Ape*. The Obſervations which we have made are repugnant to both theſe Opinions, which are both too extream. Yet we found that our *Apes* did more reſemble Man in the external parts than in the internal, and that there are more Animals which have the inward parts as like to thoſe of Man as our *Apes*, than there are which do as much reſemble Man, as our *Apes* do, in their exteriour figure.

The Rings or Holes of the *Peritonæum* were as in *Dogs*; the *Epiploon* was different from that of a *Man*, in ſeveral things. 1*ſt*. It was not faſtened to the *Colon* in ſo many places, having no connexion with the left part of this Inteſtine. 2*d*. It had another Ligature which is not found in *Man*, *viz.* to the Muſcles of the *Abdomen* by means of the *Peritonæum*, which formed a Ligament, which we have obſerved in the *Hinde* of *Canada*. 3*d*. The Veſſels of the *Epiploon*, which in *Man* proceed only from the *Vena Porta*, did nevertheleſs in one of our Subjects come from the *Cava*, having there one of the Branches of the *Hypogaſtrica*, which was united to the Branches of the *Porta*. 4*th*. In fine the whole *Epiploon* was without compariſon greater than it generally is in *Man*, becauſe that it did not only cover all the Inteſtines, which is rarely ſeen in *Man*, whatever *Galen* ſays, but it even inveloped them underneath, as it do's in ſeveral other Brutes; where it is frequently ſeen that the *Epiploon* is larger than in *Man*, eſpecially in Animals which do run, and leap with a great deal of Agility; as if it were ſo redoubled under the Inteſtines, to defend them, with the reſt of the Bowels, againſt the rude joults which theſe Parts do receive in running. It is true that the Membranes of the *Epiploon* were intire and continued as in *Man*, and not perforated like a Net, as they are in the generality of Brutes.

The *Liver* which is one of the principal *Viſcera*, was very different from the Liver of *Man*, having five Lobes as in a *Dog*, *viz.* two on the right ſide, and two on the left, and a fifth layd upon the right part of the Body of the *Vertebræ*. This laſt was divided, making as it were two leaves. In one of our Subjects, the Subſtance of the Liver was ſpeckled with ſeveral ſpots of a darker colour than the reſt, and of an Hexagonal Figure ; which we have very frequently ſeen in Brutes, and never in *Men*. The *Bladder* was faſtened to the firſt of the two Lobes, which were on the right ſide. It was an Inch long, and half an Inch broad ; it had a great *Ductus*, which was immediately inſerted underneath the *Pylorus:* This *Ductus* received three others, which inſtead of that which in Man is ſingle, and which is called *Hepaticus* ; theſe three *Ductus's* had their Branches diſperſed like Roots into all the Lobes of the Liver, ſo that the firſt had four Roots, *viz.* one in each of the three right Lobes,and one in the firſt of the left; the ſecond and third *Ductus* had both their Roots in the ſecond of the left *Lobes*; theſe Branches did run under the Tunicle of the Liver, ſo that they were apparent, and not hid in the *Parenchyma*, as they generally are. The S*apagou* had this particularity in its Liver, that it was marked with a great many black Spots : which is unuſual in other Livers that we have found ſpotted ; for they are always of a lighter Colour than the reſt of the Subſtance of the Liver : It is probable, that this blackneſs proceeded from the ſpongyneſs of theſe Parts, which being imbued with a greater abundance of Blood than the reſt of the *Parenchyma*, did thereby appear more dark.

The *Ventricle* did likewiſe differ from a *Mans*, its inferiour Orifice being very large and low ; for it was not elevated ſo high as the ſuperiour, as it is in *Man*; where it is not called inferiour by reaſon of its ſituation, but becauſe it is thro' this Paſſage that the Ventricle is emptyed.

The *Inteſtines* were hardly more like the Inteſtines of *Man* than the other Parts. In the S*apajous* they were in all but five Foot two Inches long, and in the other two *Apes* eight ; they were almoſt all of the ſame bigneſs ; the *Ileon* was in Proportion a great deal bigger than in Man. The *Cæcum* had no *Vermiform Appendix* ; it was very large, containing two Inches and a half in length, and an Inch Diameter at its beginning : It went pointing, and was fortified by three Ligaments like as the *Colon* is in *Man*, there to form little Cells : This conformation is wholly different from that of a *Man's Cæcum.* The *Colon* had its Cells as uſual, but it was not redoubled like an *S*, as in *Man*,being quite ſtrait. It had not the contracting which ſeparates it from the *Rectum* in *Man*. Beſides the Cells there was obſerved ſome leaves on the inſide,like to thoſe which are ſeen in the *Colon* of the *Oſtrich*, and which we have lately remarked in the *Jejunum* of Man. Theſe Leaves were tranſverſely extended, abutting on the Ligaments which are extended along this Inteſtine. It was thirteen Inches long, and an Inch diameter.

The *Spleen* was ſeated along the Ventricle as in Man, but its Figure was different in one of our Subjects, being made as the Heart is repreſented in *Blazonry*. Its Baſis contained an Inch. The *Pancreas* had only its Figure which made it to reſemble that of Man, its connexion and inſertion being wholly particular ; for it was ſtrongly faſtened to the Spleen, and the inſertion of its *Ductus* into the Inteſtine, which in Man is always near the *Porus bilarius*, was two Inches diſtant therfrom.

The *Kidneys* had a Figure and Situation not leſs extraordinary. They were round and flat ; their ſituation was more unequal than in Man, the right being much lower, in reſpect of the left, *viz.* half its bigneſs. The Gland called *Capſula Atrabilaria* was very viſible, by reaſon that the Kidney was without Fat. This Gland was white, and the Kidney of a bright Red ; its Figure was Triangular.

Ariſtotle ſays, that the generative Parts of the *Ape* do reſemble thoſe of the Dog. In our Subjects we found that they were different therefrom, as well as from thoſe of Man; for in the Males, the *Penis* had no Bones, as it has in the *Dog*; and the Teſticles, which in ſome of our Subjects were hid in the Groyn, without any *Scrotum*, as has been ſay'd, had a very particular Figure, being long and ſtrait, and but one line in breadth and eight in length. In one of the *Sapajous* they were found of a Figure quite contrary, and almoſt as remote from the Figure of thoſe of Man, being perfectly round; they were ſhut up in a *Scrotum*, which joyned them cloſe up to the root of the *Penis*. The glandulous *Proſtatæ* were ſmall; the *Paraſtatæ Cyrſoides* were in requital very large; they contained an Inch in length; their breadth was unequal, being four Lines towards the Neck of the Bladder, and a Line and a half at the other end, differing herein from thoſe of Man, who has them ſlendereſt near the Neck of the Bladder. They were compoſed of ſeveral little baggs, which opened into one another: the Caruncle of the *Vrethra* was ſmall, but very like to that of Man.

The generative Parts of the Female had alſo a great many things which rendered them different from thoſe of *Bitches*, herein reſembling thoſe of *Women*; there were ſome of them likewiſe which were as in *Bitches*, and after another manner than in *Woman*; for the exteriour Orifice was round and ſtrait, as in *Bitches*, and the generality of other Brutes, and had neither *Nymphæ* nor *Carunculæ*. The Neck of the Bladder had its hole otherwiſe than in *Woman*, being very far in the Neck of the *Matrix*, *viz.* towards the middle, at the place where its roughneſs began, which were ſeen only towards the extremitie of the *Ductus* near the Internal Oriface. The Truncks of the *Matrix* were alſo different from thoſe of Women, and reſembling thoſe of Brutes in that they were proportionably longer, and more redoubled by various turnings. The *Clitoris* had ſomthing more conformable to that which is ſeen in other Brutes that have it, than in that of Women, being proportionably greater, and more viſible than it is in Women. It was compoſed of two Nervous and Spongious Ligaments, which proceeding from the lower part of the *Os Pubis*, and obliquely advanceing to the ſides of theſe Bones, did unite to forme a third Body, which was ten lines in length. It was formed by uniting of the two firſt, which a very ſtrong Membrane joyned together, going from one of the Ligaments to the other, beſides a hard and Nervous Membrane which inveloped them. They terminated at a Gland like to that of the *Penis* of the Male. The little Muſcles, which were faſtned to theſe Ligaments, proceeded as uſual from the tuberoſities of the *Iſchium*. Theſe Ligaments were of Subſtance ſo thin and Spongious, that the wind penitrated, and made them eaſily to ſwell, when blown into the Network of the Veins and Arteries which is in this place. This Network was viſible in this Subject, being compoſed of larger Veſſells than they proportionably are in Women. It was ſituated as uſually under the ſecond pair of Muſcles of the *Clitoris*. Its Figure was Pyramidal, ending from a very large *Baſis* in a point, which run along the third Ligament to its extremity towards the Gland

The reſt of the Parts of Generation were like to thoſe of Women. The Neck of the Bladder had its Muſcles as in Women: For there were a great Number of fleſhy Fibres, which proceeding from the *Sphincter* of the *Anus*, were faſtned to the ſides of the Neck of the *Vterus*, and other ſuch like Fibres which did come from the *Sphincter* of the Bladder to inſert themſeves at the ſame place. The body of the *Vterus*, its Membranes, internal Orifice, its Ligaments as well the Round as Broad, and all its Veſſells had a conformation intirely like to that, which theſe ſame parts have in Women. The Teſticles, which were ten lines long and two broad, were as in Women, compoſed of a great Number of ſmall Bladders, and faſtned near the Membranes which are at the extremity of the *Tubæ* and which is called their Fringe.

The Duggs reſembled thoſe of Women, as well in what reſpects their ſituation, which was on the *Muſculi Pectorales*, as in what appartains to their compoſition, which conſiſted of a Glandulous Body, and a Teat.

At the place where the *Vena Cava* is divided to produce th two *Iliacks*, there was a Gland of the Figure and bigneſs of a middling Olive, containing five lines in length and three in breadth, Black on the outſide, and much more on the inſide. It was moiſtned with a Lymphatick Humour, wherewith its Spongious Subſtance was filled. In this ſame Subject, which was one of the two firſt *Monkeys*, there were two other ſuch like Glands, but ſmaller, towards the Origine of the *Crurals*; one on each ſide.

At the opening of the Breaſt, there was found a great abundance of Water diſperſed over its whole capacity. The *Thymus* was very large. The *Lungs* had ſeven Lobes, three on the right ſide, and as many on the left: the ſeventh was in the Cavitie of the *Mediaſtine*, as in the generality of Brutes. This again makes a Notable difference between the internal parts of the *Ape* and thoſe of Man, whoſe Lungs have generally at the moſt but five Lobes, oftener but four, and ſometimes but two. *Veſalius* affirmes that he never ſaw in Man this fifth Lobe, which he reports to be in *Apes*, ſuppoſing that they have but five. This great Number of Lobes of the Lungs clearly evinceth that Anatomiſts haue no reaſon to ſay that Brutes have the Lungs divided into more Lobes than Man, by reaſon that they have the Face and Breaſt turned towards the Earth, ſeeing that the *Ape* has generally the Face and Breaſt like a Mans.

The *Heart* was a great deal more Pointed than it uſually is in Man: which is likewiſe a Character of Brutes. Yet in the interiour Superficies of its Ventricles it had that great Number of Fibres and fleſhy Columns which are ſeen in Man.

The *Vvula*, which is in no other Brutes, was found in our *Apes* wholly reſembling that of Man.

The *Cranium* had a Figure very conformable to a Mans, being round and ſomewhat flat at the ſides, and wanting that Triangular Bone which ſeparates the *Cerebrum* from the *Cerebellum* in moſt Brutes.

The *Brain* was large in proportion to the Body. It weighed two ounces and a half. The *Dura Mater* entred very far to Form the *Falx*. The Anfractuoſities of the external part of the Brain were very like thoſe of Man in the Anteriour part; but in the hinder part towards the *Cerebellum*, there was hardly any: They in requital were much deeper in proportion. The *Apophyſes*, which are called *Mamillares*, which are great Nerves that do ſerve to the Smelling, were not ſoft as in Man, but hard and Membranous. The *Optick* Nerves were alſo of a Subſtance harder and firmer than ordinary. The *Glandula Pinealis* was of a Conical figure, and its point was turned towards the hinder part of the Head.

There was no *Rete mirabile*: for the *Carotides* being entred into the Brain, went by one ſingle Trunck on each ſide of the edg of the ſeat of the *Sphenoides* to pierce the *Dura mater*, and to be diſtributed as uſually into the *Baſis* of the Brain.

To finiſh the Deſcription as well of the external as internal parts of the *Apes* which we diſſected, by comparing them with thoſe of Man, we have made an accurate ſearch after all the Muſcles of theſe Animals, which we found for the moſt part agreable to thoſe of Man: So that we do here relate only thoſe things which we found particular in our Subjects.

The Muſcles of the Face, in that which partcipated of the *Cynocephalus* had a great deal of ſimilitude with thoſe of *Doggs*; and in the *Apes*, which had the Face flat like Man, it had nevertheleſs ſome Muſcles like to thoſe of Brutes: as amongſt others the *Maſſeter's* and *Crotophitæ*, which were a great-deal larger in proportion than in Man,

The *Muſcles* of the *Os Hyoides*, *Tongue*, *Larynx* and *Pharynx*, which do moſt ſerve to articulate a word, were wholly like to thoſe of Man, and a great deal more than thoſe of the Hand; which nevertheleſs the *Ape*, which ſpeaks not, uſes almoſt with as much perfection as Man: which Demonſtrates that ſpeech is an Action more peculiar to Man, and which more diſtinguiſhes him from the Brutes than the Hand; which *Anaxagoras*, *Ariſtotle* and *Galen* have thought to be the Organ which Nature has given to Man as to the wiſeſt of all Animals, for want perhaps of making this Reflection. For the *Ape* is found provided by Nature of all theſe Marvellous Organs of ſpeech with ſo much exactneſs, that the very three ſmall Muſcles which do take their riſe from the *Apophyſis Styloides*, are not wanting, altho this *Apophyſis* be extreamly ſmall. This particularitie do's likewiſe ſhew that there is no reaſon to think that Agents do performe ſuch and ſuch Actions, becauſe they are found with Organs proper thereunto: For according to theſe Philoſophers *Apes* ſhould ſpeake, ſeeing that they have the Inſtruments neceſſary for ſpeech.

In the *Muſcles* of the Head and Neck there was nothing particular but the *Flexores* of the Head, which in Man are inſerted into the *Apophyſis Maſtoides*: For they were faſtned to the lateral and hinder part of the *Os Occipitis*, becauſe that the Head of the *Ape* has no *Apophyſis Maſtoides*. Amongſt the Muſcles of the Armes there was only the *Palmaris* that had any thing remarkable. It was extra ordinary large. The great *Serratus*, which in Man takes its riſe only from the *Omoplatæ*, did in our Subjects proceed likewiſe from the fourth, fifth, and ſixth *Vertebræ* of the Neck.

The *Muſculus Rectus*, which in Man reaches only to the *Baſis* of the *Sternum*, did aſcend to the top, paſſing under the *Pectoralis* and little *Serrtaus*. It was fleſhy only to the half of the *Sternum*, the reſt being but a meer Tendon.

In the Thigh that of the *Quadrigemini* (which do ſerve to throw out the Thigh) called *Pyriformis*, was a great deal ſmaller than in Man ; and in ſtead of taking its riſe from the lower and external part of the *Os Sacrum*, it proceeded from the *Iſchium* near the *Cavitas Cotyloides.* The Muſcles of the Buttocks had a Figure different from thoſe of Man, being ſhorter, by reaſon that the *Oſſa Iliam Apes* are much ſtraiter than in Man. On the *Muſculi Pſoæ* there were two other little Muſcles, which are not found in Man. Every of theſe Muſcles having the ſame Origine as the *Pſoas*, did come by a long Tendon to inſert it ſelf into the upper and inward part of the *Os Pubis.*

Amongſt the Muſcles of the Leg, that of its *Flexores*, which is called *Biceps*, had not a double Origine as in Man. It proceeded intire from the knob of the *Iſchium*, and was inſerted into the upper part of the *Perona.* This ſingle Head was in requital very thick and ſtrong.

The great Toe had Muſcles like to thoſe of a Mans Thumb, even as it has the Action thereof: Which is not in the Foot of Man, where the great Toe has Muſcles very different from thoſe of his Thumb, becauſe that the Actions of theſe two parts are in Man very different.

To the Hiſtory of the Muſcles of the *Ape* might be added the Deſcription of the Pouch, which they have in their Mouth. It was compoſed of Membranes and Glands, and of a great many Muſculous and Carnous Fibres. Its ſituation was on the out ſide of each Jaw, reaching obliquely from the middle of the Jaw to the under part of its Angle, paſſing under a part of the Muſcle called *Latiſſimus.* It was an inch and a half long, and almoſt as broad towards its bottom. It opened into the Mouth between the bottom of the Jaw and the bottom of the Gumme. Tis into this Pouch that *Apes* uſe to put what they would keep ; and it is probable that the Muſculous Fibres which it has, do ſerve to ſhut and open it, to receive and put out what theſe Animals do there lay up in Reſerve.

THE

The Explication of the Stagg *of* Canada, *and* Hinde *of* Sardinia.

THe lower Figure repreſents the Diſproportion which is between the *Stag* and *Hinde*, the *Stagg* being almoſt as big again as the *Hinde*. It diſcovers likewiſe how the Hornes of the *Stagg* is covered with a Skin, and how the *Hinde* has the Back and Flanks marked with ſeveral ſpots of different ſhapes.

In the Vpper Figure.

A A. *The* Liver.
B. *The great* Ventricle *of the* Stagg.
C. *The little* Ventricle.
D. *The extremity of the* Vaſa Spermatica Præparantia
E. *The* Teſticle *it ſelf.*
F. *The* Vaſa Spermatica Deferentia.
G H H. *The* Epididymis.
I. *The* Vterus.
K K. *The* Cornua Vteri.
L L. *The round Ligaments of the* Uterus.
M. *The* Bladder.
N. *One of the* Cornua Uteri *opened to diſcover the two leaves* O O. *which it has on the Inſide.*
P P. *The* Carotides *opened to ſhew the tranſverſe lines which it has on the inſide.*
Q Q. *The* Jugular *opened to ſhew the ſix rows of* Valves *which it has,* viz. *four marked* R, *where they are three in a row*; *and two marked* S S, *where they are two and two.*
T T. *A piece of the* Jugular *repreſented at large, the more diſtinctly to diſcover a row of three* Valves *marked* V V V.
X Y Z Ω. *The end of one of the* Brow-Antlers *of the* Stagg.
X. *Part of the Horn with the Skin taken off, to expoſe to view* Grouves *wherewith the Hornes of the* Stagg *are ordinarily hollowed, to make roome for the Veſſels in the Skin which covers them.*
Y, *The peice of Skin which is cut away, and on the inſide of which is repreſented the Veſſells in it.*
Z Ω. *The reſt of the* Brow-Antler *covered with the Velvet Skin.*

THE

THE ANATOMICAL DESCRIPTION OF A STAG OF CANADA AND HINDE OF SARDINIA

THe *Stagg* was very large, being four foot from the top of the back to the Ground. Its *Hornes* were three foot long, and the *Brow-Antlers* a foot; there were ſix on each Horne, which is the greateſt number that *Staggs* do carry, according to *Ariſtotle* and *Pliny*; which nevertheleſſe is not true in this Country, where are found *Staggs* that have them to Twenty two.

The whole *Hornes* were covered with a very hard Skin, and garniſht with a very thick and ſhort hair, of the ſame Colour as that which covered the Body: it was turned in ſeveral places. *Pliny* very improperly calls this Hair, Feathers ſoft as Downe. This whole Skin had a great many Veins and Arteries filled with plenty of Bloud, which ſwelled them on the inſide next the Horne, which was all furrowed to give place to the Veſſels, after the ſame manner as the *Cranium* or Skull is fluted on the inſide, according to the diſtribution of the Veſſels of the *Dura Mater*. *Geſner* was of opinion that the furrows which are ſeen in the ſurface of the Horns of the *Stagg*, are made by *Wormes* which do ingender there in the Summer, and which do Eat it; which is altogether improbable. *Pliny* had not alſo well examined the Nature of the Hornes of the *Stagg*, when he ſays that they were like the Plant *Ferula* and the *Reed*: For the Stalks of theſe Plants, which are either hollow, or Pithy, do ill expreſs the Soliditie which is peculiar to the Hornes of the *Stagg*.

Democritus has better Philoſopized on the Generation of theſe Hornes: for he affirms that in the *Stagg*, becauſe he abounds with Bloud and grows very Fatt at the beginning of Summer, Nature conſumes a part of the Nouriſhment where-with it is overcharged, by ſending it thro ſome Veſſels, which it has in a great Number and of a conſiderable thickneſſe, to the place where the Hornes do grow. And indeed, it is a very ſurprizing thing to ſee the abundance of bloud which we found between the Hornes and the Skin which covered them, when by Fleaing off this Skin, the Tunicks of the Veins being very fine and ſmall were broke in ſunder,

This Obſervation made us to reflect upon the different Generation of the Hornes of Animals, which being of two Natures, namely ſome hollow, and others ſolid, have likewiſe two way's of growing: For thoſe which are ſolid, and without Cavitie, like thoſe of the S*tagg*, are immediatly faſtned to the *Os Frontis* from which they do ſeem to grow, this Bone being a great deal more rare and Spongious than in other Animals, as *Democritus* has obſerved. But if the firſt Origine or Germination of the Hornes of the *Stagg* do's proceed from any ſubſtance which comes out of the Bone, its increaſe depends cheifly on the Skin which covers it, and which affords it a great quantitie of Nouriſhment, thro the great number of Veſſels contained in it.

Hollow Hornes like thoſe *Oxen* are ingendered and do grow after a quite different manner: for they are not immediatly faſtned to the Scull, but they have their Cavitie filled by a Bone which is an Appendix of the *Os Frontis*; and this Appendix even as the reſt of the Scull is covered with the *Pericranium* by the means of which theſe Hornes do joyn to the Scull, and are ingendered and do grow from what they receive from the Veſſels of the *Pericranium*: for on the *Pericranium* which faſtens the Appendix of the *Os Frontis* there is a Creſt, apparently made by the Tranſudation of a matter contained in the Veſſels of this Membrane, which we found in the Cavity of the Hornes of the *Gazellas* incomparably greater, fuller of Bloud, and more numerous, than they are in the reſt of the *Pericranium* which covers the other Bones of the Head. So that it muſt be underſtood that even as Solid Hornes do take their Nouriſhment and increaſe by their external Superficies, thoſe which are hollow do take it at the internal: for when the firſt Cruſt begins to be hardned on the Production of the *Pericranium*, which covers the Pointed Appendices of the *Os Frontis*, by hardning almoſt after the manner as Nails do harden at the ends of the Fingers; between this firſt Cruſt and the *Pericranium* there is ingendered another which glues it ſelfe to the former and thruſts it forward; and thus there is ſucceſſively ingendered ſeveral Cruſts one upon another, almoſt after the ſame manner as Snail-ſhells, and Oyſter-ſhells are ingendered and compoſed of ſeveral *Laminæ* or Plates glued to each other. This is the reaſon that hollow Hornes are generally wrinkled and ruffled like ſhells, and that they are eaſily ſeparated into ſeveral Leaves.

Ariſtotle has given ſome Idea of this manner of the Generatinn of hollow Hornes, in ſaying that there enters into their Cavity ſomething hard, which ſprings from the Scull; which muſt be underſtood of the Bone which enters into the Cavity of the Hornes: But he ſpeakes not of the *Pericranium* to which the Horne is immediately faſtned,and from whence it is probable that it takes its Origine and Nouriſhment.

The Generation of hollow Hornes is likewiſe different from that of ſolid ones, by the different quality of the matter, which is more aqueous in hollow Hornes, and more Terreſtrial in ſolid ones. Hollow Hornes do eaſily ſoften before the Fire, as not having their Concretion by the Exiccation and Conſumption of the Aqueous parts, but by the Coagulation of a Matter which hath not a conſiſtence ſo firm, without the cold which does harden it: and ſolid Hornes are of the Nature of the Bones from which they do proceed, being of a Terreſtrial matter, which, according to *Ariſtotle* and *Pliny*, is hardened on the Head of *Staggs* by the heat of the Sun: *Ariſtotle* makes alſo a remark which demonſtrates that the matter of *Staggs*-Hornes is Terrene, dry and of the Nature of Stone; for he ſayes that there has been ſometimes *Staggs* taken, on whoſe Hornes there was found *Ivie*, which had there taken Root as it do's on Stones: and Naturaliſts have obſerved that the *Ivie* do's frequently grow in places where *Staggs* Hornes are Buried. This conjecture may be confirmed by the conſideration of that excreſcence which is peculiar to the *Stagg*, called *Lachryma Cervi*; which comes out, as it is ſaid, from the great *Canthus* or Corner of the Eye, being ſtrongly faſtened to the Bone, out of which it grows; according to *Scaliger*: for this excreſcence is ſo like a Stone, that ſome do think it really is one, and that it grows not out of the *Stagg*, being very far from giving credit to what Authors report of its Generation; *viz.* that it comes out of the Corner of the Eye of the *Stagg*, when to cure it ſelfe of the Wormes which it has in its *Inteſtines*, it eats Serpents, and plunges into the Water up to the very Eyes. The Bone which is found at the *Baſis* of the *Staggs* Heart, is likewiſe a Sign that this Animal do's exceedingly abound in a juice capable of being eaſily converted into a Bonie and as it were Stoney Nature.

The *Inteſtines* being taken all together, did meaſure Ninety ſix foot in length. The ſmalleſt contained ſixty ſix foot, and the great ones without the *Cæcum* twenty. The *Cæcum* was one foot ten inches in length and ſix inches in breadth towards its *Baſis*. It went leſſening towards its Point as uſual. This extraordinary length of the *Inteſtines*, which is proportionable to the greatneſs of the Ventricle in Animals which do live on Graſs, is not found in thoſe which are fed with fleſh; becauſe that Graſs, being not ſo eaſy to be changed into Bloud, and this Nouriſhment affording it leſs matter than fleſh, it was neceſſary to have the Ventricles thus large, to contain a great quantity of Graſs, and that the *Inteſtines* ſhould be proportionably long, to make room for the Natural heat to operate a long time on the Nouriſhment retained and conducted thro long Turnings.

There were two *Ventricles*, a greater and a ſmaller, which ſeemed to be the *Duodenum* inlarged. The great *Ventricle* being blown was five foot round. It was compoſed of ſeveral other *Ventricles* heaped in one, by reaſon of four or five bunches which it had connected together by a Membrane which did joyn, and make them to forme to this *Ventricle* ſeveral Cells. On this Membrane there was another which did cover and lock up the whole *Ventricle*. This Membrane was faſtened behind to the *Ventricle*; Before it was joyned to it only at top, the reſt being wholy ſeparated, and greatly extended, by a great deal of wind which it ſhut up with the *Ventricle* and *Inteſtines*, which it alſo covered like an *Epiploon*. The upper part which covered the *Ventricles* was thin, and tranſparent, without Fat, Glands, or apparent

Veſſels: the part which deſcended to incloſe the *Inteſtines* had ſome Veſſels and Fat, but in a very little quantity.

The *Spleen* was round, thin, and wholly adherent to the great Ventricle. It was ſix inches Diameter. The Veſſels which do make the *Vas Breve* were utterly imperceptible. The Gibbous and upper part was faſtned to the *Diaphragme* by three ſtrong Ligaments.

The *Liver* had but one Lobe, and was only Cleft before, and quite whole within. The right ſide was ſomewhat more extended that the left, and made a point towards the Kidney. There was no Gall-Bladder.

The *Kidney* was very large, being five inches long and three broad. There was no *Ren Succenturiatus*.

The *Penis* had no bone. The proper Membrane of the Teſticle was immediately faſtened to the Glandulous Subſtance, ſo that it was abſolutely inſeparable therefrom, and more than uſual in other Animals. Over this Membrane were an infinite number of Blood-Veſſels, ſome whereof were ſtrait and as big as a Bodkin; others were undulated, and as it were frizled, very ſmall, about the bigneſs of a Pin. The Glandulous Subſtance of the body of the Teſticle was Yellow; that of the *Epididymis* of a pale livid Red. The Uniting of the *Vaſa Præparantia* was wreathed and confounded, and made a Tube about the bigneſs of ones Finger, which produced the *Epididymis*, which covered and imbraced the top of the body of the Teſticle even as the Cup of an *Acorne*. This part reſembling an *Acorne* did produce a body about the thickneſs of ones Finger, which deſcended along the body of the Teſticle, being there faſtened, and made towards the bottom a kind of a Teat, from whence it returned along the ſide oppoſite to that by which it deſcended, and formed the *Vas Deferens*, which was about the thickneſs of a *Swans* quill.

The *Lungs* had ſeven Lobes, four on the right ſide and three on the left. The *Heart* was very large, almoſt round and ſoft, becauſe that the Ventricles were very large. There was a Bone, as uſually in S*taggs*.

TO the Deſcription of the S*tag* we do joyn that of the *Hinde*, to diſcover wherein theſe two Animals did agree, and in what they were unlike beſides the difference of the Sex.

The highth of this *Hinde* was two foot eight inches, from the back to the Ground. The Neck was a foot long. The hind-legg, from the Knee to the end of the foot, was two foot, and to the Heel one foot.

The *Hair* was of four Colours, *viz.* Fallow, White, Black and Gray. There was ſome white under the Belly and on the inſide of the Thighs and Leggs: On the Back it was of a dark fallow; On the Flancks, of an Iſabella-fallow: Both the one and the other on the Trunck of the Body was marked with White Spots of different figures: along the Back there were two rows in a direct Line; the reſt was confuſedly Speckled. Along the Flanks there was on each ſide a White line. The Neck and Head were Gray. The Tail all White underneath, and Black at Top, the Hair being ſix inches long.

The *Epiploon* was faſtened to the *Peritonæum* directly over the Navel, and inveloped the *Inteſtines* underneath. It was compoſed of very thin Membranes, and ſmall Veſſels without Fat: It was double.

The *Liver* was ſmall, and like to that of the *Stagg*, in that it was not ſeparated into ſeveral Lobes, having only the fiſſure, which is generally at top towards the middle, and an other underneath inclining to the right ſide There was not alſo any *Gall-Bladder*.

The four *Ventricles* were better diſtinguiſhed and ſeparated each from other than they were in the *Stagg*, where there was diſtinctly ſeen but two. The firſt and greateſt Ventricle had on the inſide a Membrane eaſily ſeparable from that of the outſide, as in the *Gazella*. This internal Membrane was rough by an infinite number of Aſperites or Teats, as is generally ſeen in Animals which chew the Cud. All this great *Ventricle* was contracted in ſeveral places, and ſeparated in different Pouches as in the *Stagg*: it was filled with Graſs, amongſt which there was found ſeveral pieces of Skin, of ſhoe-Soles about the bigneſs of a Crown-piece, ſome pieces of Lead about the bigneſs of ones Nail, which ſeemed worn and fretted, and ſome Fragments of ſlate. This may make one to think that theſe ſorts of Animals do haſtily gather their Food in the Fields, and that they do wait to cull it leiſurely when they Chew it. The ſecond, third, and fourth *Ventricle* were not different from thoſe of *Sheep*.

The *Inteſtines* were very long as in the *Stagg*, but leſs in proportion. They meaſured in all forty foot. There were two ſorts: the firſt which made about a quarter, were Grayiſh, and plaited in Folds ſix inches long: the others were of a dark Red, and folded very ſmall in Cells. The *Meſentery* was compoſed of very fine Membranes.

The *Spleen* was covered with a hard, thick and whiteiſh Membrane: Its figure was round; it was like that of the *Stagg*, ſtrongly knitt to the Ventricle and *Diaphragme*.

The *Cornua Uteri* were long and bent into ſeveral Anfractuoſities. Their extremity was applyed to the Teſticle which was ſmall, on the inſide of each of theſe Horns there were two folds of the internal Membrane, which did forme ſome leaves ranged according to the length of the Hornes, almoſt after the ſame manner as is ſeen in the third and fourth Ventricle of Animals which chew the Cudd.

The *Heart* was extraordinary large and ſoft: Its *Ventricles* were extended by a quantity of coagulated bloud which filled them. The *Lungs* had ſeven Lobes.

The Truncks of the two *Jugulars*, as well the internal as external, had each ſixteen Valves diſpoſed in ſix rows, about two inches diſtant from each other. The four upper rows conſiſted each of three Valves; the two lower ones had only two, but they were larger than thoſe of the upper rows. The diſpoſition of theſe Valves was ſuch, that the aperture of the Sacks which they did form was toward the Head, to ſtop, as it is probable, the too great impetuoſitie of the Bloud which falls in its returne from the Brain into the Axillary Branches. Thoſe of the Moderns who are ignorant what is the Motion of the bloud in the Veines, have attributed this uſe to all the Valves of theſe Veſſeles, the ſituation of which is found to be contrary to the Motion and courſe of the Bloud, after the Manner as they underſtand it, and favourable to the courſe which it efectively has for the Circulation, that is to ſay for its return towards the Heart. *Bartholinus* has remarkt two Valves in one of the *Iugulars.* *Riolanus,* who firſt found out theſe two Valves affirms that they are never found but in the internal *Iugular,* although we have alwayes found them in the external as well as Internal: But this ſituation of the Valves contrary to the Motion of the Bloud towards the Heart, has as yet been ſeen only by *Amatus Luſitanus,* who has obſerved ſome of this Nature at the beginning of the *Azygos,* and which he thought to ſerve to hinder the Bloud of the *Azygos* from returning into the Trunck of the *Cava*; but this Conformation is extraordinary, whatever this Author ſayes; who averr's himſelf to have ſeen it a thouſand times; becauſe that all Anatomiſts, with an unanimous conſent, do teſtifie and avow to have ſeen the contrary, and never to have found Valves in the Veins, whoſe Situation favoured not the Motion of the Bloud towards the Heart.

The *Carotides* having been opened long-ways, it was obſerved that they had ſeveral Rays like tranſverſe Cutts, which interrupted the continuitie of the Fibres, which are according to the length of the internal Membrane of this Artery: which appeared to be made to knitt together theſe Fibres, and to fortifie them even as it is ſeen in the Fibres of the right Muſcle of the Belly, which are ſo interrupted by the tranſverſe lines, that they are called *Enervations.* It was ſearcht whether the ſame thing could be found in the *Crural* Artery, but it was ſmooth and even, and had not theſe Cutts.

The *Globe* of the Eye was an inch and a half in Diameter. The *Cryſtalline* was more convex behind than before.

The Explication of the Figure of the Pintado

THe *Pintado* which is repreſented in the lower Figure, has no Tuft at the root of the Beak, like that whoſe Head is repreſented in the upper Figure. As to other particulars, the Ten which we deſcribe, had all that is remarkable in this *viz.* the Tail turned downwards as it is in *Partridges*, the Neck and Leggs longer than *Partridges* are ; the Feet provided with Membranes after the manner of Water-Fowl ; the Head covered with a Caſque ; the top of the Beak garniſhed with two Appendices ; and the whole Plumage black, or dark-gray, Spekled with white Spotts.

In the Vpper Figure.

A B. *One of the Feathers of the Wing.* A *is the part of the Wing which is uncovered.* B *is that which is covered by another Feather.*
C D. *One of the Feathers of the Belly.* C, *the part of the Feather which covers the Down marked* D.
E F G. *The Head almoſt as big as the life.* E, *the Tuft which grows out at the root at the Beak.* F. *the Caſque or Bonnet.*
G *The fleſhy Beards.*
g. *The hole of the Ear.*
H H. *The ſmall* Muſcles *of the* Aſpera Arteria.
I I. *The* Artery *of the* Lungs *divided into two Branches.*
K K. *The* Carotides, *the left of which ſeems to proceed immediately from the Heart.*
L. *The Croſs or bending of the* Aorta *on the right ſide.*
M N. *The* Heart.
N. *The Right* Auricle.
O O. *The* Liver.
P. *The* Gall-Bladder.
Q. *The* Ductus *which conveys the Choler into the* Inteſtine.
R. *The* Inteſtine.
S. *The* Ventricle *or* Gizard.
T T. *The* Venæ Iliacæ.
V. *A ſingle* Teſticle *faſtened to the* Bifurcation *of the* Iliack Veins.
X X. *The* Emulgent Veines.
Y. *The continuation of the Trunck of the* Aorta *beyond the* Venæ Iliacæ.
a a. *The* Iliack Arteries *which do ſerve for* Emulgents.
b b. *The* Kidneys.
c c. *The* Ureters.

THE
ANATOMICAL DESCRIPTION
OF TEN
PINTADOS.

THe Birds which we deſcribe are a kind of Hen called *Pintado*, by reaſon of the exactneſs of the Figures which ſeem as if Painted on its Plumage; theſe figures not being irregular and as it were accidentally made, as in the generality of other Birds. Upon this very reaſon ſome of the Ancients made Choice of the Names which they have given to theſe Fowl: For by *Varro* and *Pliny* they are called *Variæ*, and by *Martial Guttatæ*, by reaſon of the white Spots wherewith their whole body is diverſified and Speckled, as it were with ſeveral drops. Their Eggs are likewiſe Painted, and Chequered with white and black: thus this ſort of diverſitie is a thing Natural and perpetual to theſe Birds, which this particularity diſtinguiſhes from common Hens, which in the *Genus* of Birds are almoſt the ſole ones, which have not the Plumage alwayes with the ſame Colours in their Species; Hens being indifferently white, black, gray, yellow, or mixt with all theſe colours. Other Authors have given to the *Pintado*'s Appellations taken from the Country where they do generally breed (which is *Africa*) by calling them *Hens* of *Africa*, *Barbary*, *Numidia*, *Guinea*, *Mauritania*, *Tunis*, *Pharos*, that is to ſay *Ægypt*. *Margravius* reports that in the Kingdome of *Congo* it is called *Queſele*. *Pliny* relates that they are alſo called *Meleagrides*, becauſe that according to the report of his time, they went annually from *Africa* into *Bæotia*, and come to beat themſelves near the Tombe of *Meleager*, whoſe Story feigns that the Siſters were changed into theſe Birds. There are ſome which do think that the *Meleagris* is the *Cocq-d'Inde* or *Turky-Cock*; which ſhall be examined in the Sequel.

The ten *Pintado*'s whereof we have made the Diſſection, were of the ſize, and almoſt the ſhape of an ordinary Hen. Some are of Opinion that they do better reſemble the *Partridge*. But the length of their Neck, and Leggs, which did even ſurpaſs that of the Neck and Leggs of Hens, have made us to diſapprove this Similitude: We only found that they had the Tail bent down-wards like the *Partridg*, and not held up like the Hen. But they have no Characteriſtick more particular of the Hen than the fleſhy Appendices which do hang down on both ſides of their Jaws, which are not mett-with in any other Bird, and which even in the *Pintado* have ſomething different from thoſe which are in Hens; as ſhall hereafter be explained.

Their whole Plumage was only of two colours, *viz.* White and Black. The White was every where perfectly White: the Black was alſo in ſome places perfectly Black, but in the moſt it was faint, and inclining to a dark-Gray.

The top of the Neck inſtead of Feathers, was only garniſht with a black Down, which did better reſemble Hair than Feathers. Theſe Hairs being about two lines long, were turned upwards, contrary to the ordinary ſituation of Hair and Feathers. In one of our Subjects, towards the hinder part of the Head, theſe Hairs were almoſt an inch long, and made as it were a Tuft. The under part of the Neck had little dark-gray Feathers markt with White. Theſe Feathers went inſenſibly three inches in length and one in Breadth. The half of theſe Feathers, towards the root on both ſides of the Quill or Stem, was garniſhed with Beards or branchings like grayiſh white Down, above half an inch long on each ſide. Each Down or Beard was disſheivelled, and divided as it were into ſeveral fine Locks or threads towards its extremity. Near the Quill or Stem the roots of each beard were joyned together by the Crochets or little Fibres wherewith the Beards or branchings of the feathers which do ſerve for flight, uſe to be faſtened; and which are deſcribed in the *Oſtrich.* The other half of theſe Feathers was compoſed of theſe ſame ſort of Beards or Branchings, which are harder and firmer. They were of a dark-gray intermixt with white round Spots, two lines Diameter at the moſt. They by an equall order did make three rows on each ſide with ſix in each row; ſo that the ſixth of every row, which was common to the oppoſite rank, whereof it did likewiſe make the ſixth, did meet on the tail of the Quill or Stem. This Quill which was black, did grow white at the place of the mark or Spot, as if on a black Skin there had been thrown ſome drops of *Aqua-Fortis*, which had diſcoloured it: Which illuſtrates the thought of *Martial*, by whom the *Pintado*'s are called *Guttatæ.*

The Feathers of the Wing's were marked after another manner, having two Sorts of Spots, ſome of which were round, and others long. Theſe marks were white, an a dark ground of three different Kinds: for at the place where the Feather is covered with another Feather, this ground was ſimply dark-gray; In the reſt of the Feather this ground was abſolutely black at the Circle of the white Spot; the reſt was mixt with white and black Speks.

Clytus Mileſius Ariſtotle's diſciple, who deſcribes the *Pintado* in *Athenæus* with great exactneſs, principally inlarges upon the particularities of the ſhape and colour of the Spots of theſe Feathers, and even to the having obſerved that the black which edges the Spots is reciprocally intermixt with the white in form of a Saw; which is very difficult to comprehend, if one ſees not theſe feathers, or their figure: wherefore we have in our Figure exactly deſigned them.

The *Tail* as has been ſayd, was a little bent down-wards as in *Partridges*. The Leggs were covered with little feathers layd, and as it were glued, upon the Skin; they were of a dark-Gray and ſpotted with White like all the reſt.

The *Head* had no Feathers; the upper Eye-lidd had only long black hairs, which were raiſed upwards. At the top of the Head there was a *Creſt*, or kind of Caſque, which Modern Authors do compare to the *Bonnet* of the *Doge* of *Veniſe*. This *Creſt* is by *Margravius* called *Mitella Cutacea*. We found that it was only covered over at top with a dry and wrinkled Skin of a dark Fawn-Colour, which was extended from the Beak to the hinder part of the Head which it covered, being cutt away over the Eyes. But the inſide was of a Spongie Subſtance, ſofter than the Bone, and reſembling, as ſay's *Clytus*, a fleſh hardened and dryed like Wood: which may make one to think that D' *Alechampius* and *Caſaubon* had no reaſon to correct the ancient exemplars of *Athenæus*, where it appears that this Creſt is τὸ σῶμα ξυλοειδὲς, by putting τὸ χρῶμα, inſtead of τὸ σῶμα: for altho the colour of this Creſt reſembles ſome ſort of Wood, yet indeed its ſubſtance has more reſemblance with all ſorts of Wood than its colour, becauſe that the colours of Woods are much more different amongſt themſelves than their Subſtances. D' *Alechampius* is perhaps miſtaken, when he ſay's that this Creſt is peculiar to the Males; for we have found it in all our Subjects as well Males as Females.

The *Eye* was large and open; the Poet *Sophocles*, according to *Pliny*, averr's that the yellow *Amber* is made of the Tears which do drop from the Eyes of the *Pintados*, which are beyond the *Indies*.

The *Beak* was like to that of an Hen. In two of our Subjects we found, on the middle of the root of the Beak, a Tuft compoſed of twelve or fourteen threads four lines in length, and about the bigneſs of a ſmall Pin, of colour and Subſtance like the Briſtles of a *Hog*. On each ſide of the Beak a blewiſh Skin was extended towards the Eye, which it incircled, and grew black there. *Belonius* poſitively affirmes that it is White round about the Eye. This Skin made the Eye-lidds, and covered the two Appendices with a Subſtance half fleſhy and half Cartilaginous: they hung down on both ſides the Cheeks, being faſtened to the upper Jaw, and not to the lower, as they are in Hens, and as *Belonius* has Painted them in his *Pintado*. We found them of different ſhapes in our Subjects: for in ſome they were Oval, in others ſquare, in others Triangular. They were alſo of different colours. *Margravius* ſimply declares that they are Red. We obſerved that they were Red in the Females, and Blew in the Males; although all Authers do report that this Bird has not any exteriour Mark which makes the diſtinction of Sex. On this difference of Colours *Columella* grounds a diſtinction between the *African* or *Numidian* Hen and the *Meleagris*, ſaying that the *African Hen* has its Appendices Red, and that the *Meleagris* has them blue: But there is no probabilitie that ſuch a difference can conſtitute divers Species, ſeeing that theſe Colours may eaſily change in the very ſame Individual upon light occaſions, as is obſervable in the *Turky-Cock*, in whom the Combe Waxes Red when he is Angry, and who has it generally blue.

At the ſide of theſe *Appendices* backward, there is plainly ſeen the hole of the Ear, which in other Birds is hid by the feathers which do adorn the Head; this hole was extraordinary little, perhaps by reaſon it is uncovered.

The *Feet*, which, as has been ſay'd, were very high, were of a dark-gray. Some great Scales covered them before; and behind they had only a Skin made rugged by an infinite number of ſmall Eminencies like thoſe of *Chagrin*. The three fore-Toes had, even to the third of their length, a Skin which joyned them together as in the *Gooſe*. The hind-Toe was ſhort, and the Males had no Spurr behind the *Foot*.

After having made theſe remarks on the *Pintado*, and read what the Ancients have written of the Bird *Meleagris*, we think it very hard to be of the ſame Opinion with *Turnerus*, *Belonius*, *Geſner*, *Aldrovandus*, and all the Authors which have writt of theſe Birds, and which do hold that the *Meleagris* of the Ancients is the *Turky-Cock*, and not the *African* Hen, or *Pintado*; for it is eaſie to prove that whatever the Ancients have reported of the Bird *Meleagris* is found in the *Pintado*, and that nothing of all this occurrs in the *Turky-Cock*, which on the contrary has ſome things particular which are not in the *Meleagris* of the Ancients. For the particularities which *Clytus* attributes to the Bird *Meleagris*, *viz.* the Creſt of a Lignous Colour and Subſtance, the Beards or Appendices of the Cheeks, the numerous white Specks almoſt regularly and with Symmetry placed on the feathers, of the ſhape and ſize of a Lentill, the Leggs without Spurrs in the Male, and the perfect reſemblance of the Male and Female, are ſeen in the *Pintado* and are not found in the *Turky-Cock*. What *Pliny* reports of the Bird *Meleagris* do's very well agree with the *Pintado*, but not at all with the *Turky-Cock*: for he ſay's that the *Meleagris* is a Bird that lives in Lakes and Rivers: now the Skin which the *Pintado* has between the Toes of the Feet in found only in Animals which do love and dilight-in Watry places, where it is known that the *Turky-Cock* takes no pleaſure. In fine, in the exact Deſcription which the Ancients have made of the *Meleagris* it is impoſſible, if it were the *Turky-Cock*, that they ſhould omitt the remarkable and particular things which appear in the *Turky-Cock*, and which are not found in the *Pintado*, ſuch as are the way of diſplaying its Tail, of dragging its Wings againſt the ground, of extending and ſuffering the Combe on its head to hang, of having the Neck rough and wholly void of feathers, and of having a Lock of black Hair at the Breaſt.

As for what reſpects the Inward parts, we found the *Oeſophagus*, as in moſt Birds, ranged on the right ſide of the *Aſpera Arteria*. It was inlarged before its entrance into the *Thorax*, and made a Craw of the bigneſs of a Tennis Ball, when it was blown up; afterwards it was contracted to paſs thro the *Thorax*. This contracted part meaſured two inches and a half in length. This whole *Oeſophagus* was ſpread over with a great quantity of Veſſels, which were not viſible in the paſſage, which from the dilatation that we have taken for a Craw paſſed to the Gizard; this paſſage being of a Subſtance hardder, whiter, and more Nervous than the reſt. The *Gizard* was as in the Hen. It was found for the moſt part filled only with Gravel. Its internal Membrane was very much plaited, and eaſily ſeparable from the fleſhy part. Its ſubſtance was like to white glue; ſo that this Membrane being ſeparated from the Gizard, was eaſily dryed, and waxed hard and brittle like Glaſs.

The *Inteſtines* were three foot long without reckoning the two *Cæcums*, which were each ſix Inches. The *Duodenum* was much larger than the others, being above eight Lines. The *Cæcum's* were not of a uniform breadth as in the generality of Birds, but did go inlarging. They were faſtned by the Membranes of the *Meſentary*, and received veſſels therefrom like the other *Inteſtines*. There was no *Pancreas*.

The *Liver* was divided into two Lobes, which at the top had each a Cavitie to receive the point of the Heart The Cavity of the right Lobe was greater and deeper than that of the left, becauſe that the point of the Heart was turned towards the right ſide. The lower extremitie of the Lobes was faſtened to the *Diaphragme*, which deſcends from the top downwards, and to the Bladders which the Lungs form in the lower Belly of Birds. In moſt of our Subjects the Liver was Scirrhous, and filled with a great quantity of hard yellow Grains, ſome as large as Peaſe, and others leſs. We found a *Gall-bladder* only in two of our Subjects. In the one it was nine Lines in length and ſix in breadth. It had a *Ductus* from its bottom, which was inſerted into the *Inteſtine* near the *Pylorus*. In the other it was an Inch and half long, and four Lines broad, being faſtened to the hollow part of the right Lobe; and the *Ductus* was from its middle, and not from its lower extremitie, and inſerted it ſelf into the *Inteſtine*, four Fingers beneath the *Pylorus*. In the other Subjects which had no Bladder, the *ramus Hepaticus* was there found very large and viſible. It meaſured five Inches in length, and was inſerted into the *Inteſtine* ſix Inches beyond the *Pylorus*.

Towards the upper part of the *Gizard* there was a body of an oval Figure nine Lines long, and of a dark red Colour, and a firm Subſtance. It had connexion with the Trunk of the *Vena Porta*, with that of the *Cava* and *Aorta*, with the *Inteſtines* and *Ventricle*, by ſome very viſible branches. Some Modern Authors have obſerved that Birds which have a fleſhy *Ventricle* have no Spleen. Yet we are of Opinion that this body could be no other thing than a Spleen, as well by reaſon of theſe Connexions, as of the Sympathie which it ſeem'd to have with the Liver: becauſe it was found that in all the Subjects where the Liver was Scirrhous, this part was after the ſame manner; altho' the hard and compact Subſtance of this body in the ſubjects where it was Scirrhous, and its Figure ſo regularly oval, might cauſe a belief that it was a *Teſticle*: but there were two other round bodies, four Lines Diameter, couched on the Loyns, and faſtened to the Trunks of the *Vena Cava* and *Aorta*, which were the true *Teſticles*. In one of the Subjects theſe round bodies were ſingle, and faſtened on the place of the diviſion of the *Iliacks*.

The Air being blown into the *Aſpera Arteria* it made all the Bladders to ſwell, which received the Air after it had paſſed thro' the Lungs, and of which there are ſome that do deſcend into the lower Belly of Birds; it is obſerved that the *Pericardium* was likewiſe blown up. This Remark may be of ſome Importance to diſcouer the uſes of Reſpiration, and the Advantages which the Air, being by this means introduced into the *Thorax*, may bring to the Heart, by the Compreſſion it may there cauſe, by the Impreſſion of its

Qualities, by the reception of the Fumes which it inceſſantly exhales in the continual heat in which it is, &c.

The Membrane of the *Pericardium* was not juſt fit and faſtened to the Heart as is uſual, but was a great deal extended towards the Point, making a ſack or *Appendix* half an Inch long. In one of the Subjects, this *Appendix* was a great deal longer; for deſcending between the two Lobes of the Liver, it went to be faſtened to the Gizzard.

The *Aſpera Arteria*, after having entered the Cavity of the *Thorax*, had two ſmall *Muſcles* which were knitt to its *Anteriour* part, and which turning on the one ſide and the other ſomewhat downwards, were by ſeveral *Fibres* united to the Veſſels of the Heart. Theſe *Muſcles* were each almoſt an Inch long, round like a Cord, and about the thickneſs of two thirds of a Line. We have found theſe ſame *Muſcles* in a great many Birds: in moſt they do faſten the *Aſpera Arteria* to the *Sternum*.

The *Lungs* were of Spongious fleſh, perforated with ſeveral little holes as bigg as the head of a ſmall Pin, regularly placed as well full as empty, and covered with a very fine *Tunicle*. They were of a Pale-red inclining to Aſh-colour, being two Inches and a half long, and nine Lines broad, and five thick.

The *Heart* meaſured an Inch and half in length, and an Inch in breadth towards its *Baſis*; it was very pointed. The *Aorta* being come out of the left *Ventricle*, was turned directly forward being ſtill in the Heart, and covered with the right *Auricle*; ſo that it ſeem'd to proceed from the right *Ventricle*, and croſſed over in this place, to deſcend to the right ſide. For this ſame reaſon the left *Carotide* did likewiſe appear to come from the Heart, altho' it proceeded from the Trunk. The diviſion of the Trunk of the *Aorta* which formes the *Iliack* Branches, was an Inch and half lower than the diviſion of the *Iliacks* of the *Cava*. Theſe Branches were a great deal leſſer than thoſe of the *Cava*. They ſerved for *Emulgent* Branches, the Kidneys being there faſtned. The *Emulgent* Branches of the *Cava* did likewiſe come from the *Iliack* Branches of the *Cava*; and after being joyned to the Kidneys, did paſs forward, like as the *Arteries*. The ſame Trunk of the *Aorta*, after its diviſion into the *Iliack* Branches, did continue, and deſcend even to the *Anus*, caſting forth the ſeveral Branches to the right and left, to form the *Crurals*.

The *Brain* had nothing particular. It is only obſerved that there was two bony *Apophyſes* about the bigneſs of a little Pin, and two Lines long, which proceeding from the two ſides of the *Cranium*, did joyn, and make an Angle between the *Cerebrum* and the *Cerebellum*.

The *Cryſtalline* was more convex within than without the Eye.

The Explication of the Figure of the Eagle.

THe lower Figure repreſents only one of the *Eagles* which are here deſcribed, becauſe that they were almoſt all alike. The main and principal difference was in the Feathers of the Neck, which were compoſed only of a very long and ſmooth down in the Male; whereas in the Females they were like Scales. It muſt be likewiſe obſerved, that the greatneſs of the Claw of the hinder Foot could not be repreſented ſuch as it would appear, if theſe Claws were not hid, as they neceſſarily are by the Bough on which the *Eagle* is perched.

In the Upper Figure.

A. *The Trunk of the* Vena Porta.
B. *The Neck of the* Gall-Bladder.
C. *The* Ductus Cyſticus.
D. *The* Ductus Hepaticus.
E. *The* Spleen.
F. *The* Pancreas.
G G G. *The Branches of the* Vena Porta *and* Cæliaca Arteria, *which go to the* Spleen *and* Inteſtines.
1 2 3. *The three* Ductus Pancreatici.
H. *The* Aſpera Arteria.
I. *The* Oeſophagus *blown up.*
K. A glandulous *body faſtened to the upper part of the* Oeſophagus.
L. *The* Ventricle.
M. *The* Spleen.
N. *The Branches which are diſtributed to the* Spleen *and* Inteſtines.
O. *The* Pancreas.
P. *The* Tongue *as bigg as the Life.*
Q. *The* Eyes.
R. *One of the* Feathers *of the* Breaſt *which is compoſed only of Threads like* Down, *and which has two Stems like two Branches which proceed from a third, which is as it were the Trunk.*
S. *The* Medulla Spinalis *divided and ſeparated as it were into two Branches which afterwards joyned again.*
T T V X. *The ſame Marrow cut through, to ſhew how the two parts* T T, *which divide in two the Trunk of the Marrow on the fore-ſide, are joyned together at the hinder part* X, *to form the* Cavitie V.
Y Y. *Two ſmall* Appendices *which ſupply the place of the* Cæcum, *having on the inſide a very ſmall* Cavitie.

THE
ANATOMICAL DESCRIPTION
OF THREE
EAGLES.

THeſe three *Eagles* were almoſt alike in bigneſs forme, and Plumage. The inward Parts were in ſome things different, principally becauſe they were of different Sexes. The greateſt which was a Female, meaſured from the Extremity of the Beak to that of the Tail, two Foot nine Inches; from the end of one Wing, to the end of the other, when expanded, ſeven Foot and a half. The Beak was two Inches and a half long, without comprehending the bending, which was nine Lines. The whole Head, comprehending the Beak, was four Inches and a half; the Neck five Inches and a half; the Leg together with the Thigh, to the extremitie of the Talons, fifteen inches. It weighed ten pounds. Its whole Plumage was of a Cheſt-nut Colour almoſt black, except the bottom of the Neck before, and of the Belly, which was of a white ſullied with a reddiſh gray. The Feet were ſmall in proportion to the Body, and of a blewiſh gray. The Beak was all Black.

The two others, one of which was a Male and the other a Female, (and which were ſomewhat leſſer) had the Beak black at the end, yellow towards the beginning, and blewiſh at the middle. The *Feet* were yellow, covered with Scales of different ſizes; thoſe at top of the Toes being large and ſquare, eſpecially towards the extremitie; the other being very ſmall. The Talons were black, crooked and very great, eſpecially that of the hinder Toe, which was almoſt as big again as the others.

The *Plumage* was of three Colours, *viz.* dark Cheſt-nut, red, and white. The top of the Head was mixt with Cheſt-nut and red. The Breaſt and Belly were mixt with white, red, and Cheſt-nut: the Wings had a great deal of Cheſt-nut, little red and leſs white. The Quills of the great feathers of the Wings were nine lines in compaſs. The Plumes of the Tail were very brown towards the extremitie, having ſomthing of white towards their Origine. The Thighs and Leggs even to the beginning of the Toes, were covered with Feathers half white, and half red, each Feather being red at the end, and white towards the beginning.

Naturaliſts do ſay that *Eagles* have the Leggs thus provided with Feathers as well to defend them from the Beak and Claws of Birds, when they catch and take them in their Talons, as to keep them from the cold of the Snow, to which they are expoſed on the tops of the Mountains where they generally reſide. *Belonius*, who has deſcribed ſeveral ſorts of *Eagles*, has deſcribed them all without Feathers on their Leggs.

Beſides the great Feathers which covered the Body, there was at their root a very white and fine Downe, about an inch long. This Downe ſerves likewiſe to Arm the *Eagles* againſt the Cold, of which they are very ſenſible: which is the reaſon that Falconers, when they make uſe of *Eagles* for high flying, do take from them a part of that Downe and of the other Feathers from their Belly, to the end that they riſe not too high, being hindred by the cold of the middle Region of the Air. The other Feathers which covered the Back and Belly of our *Eagles*, were four or five inches long. Thoſe which covered the Thighs on the outſide, were ſix inches, and reached three inches beyond the Heel. Thoſe whereby the Breaſt and Belly were decked in the Male meaſured ſeven inches in length and three in breadth: they were ſoft, having on both ſides only a long Downe, the fibres of which were not claſped together, as they generally are in the ſtrong Feathers which are ranged like Scales. Theſe Feathers were double: for each Quill being come out of the skin about two lines and a half, did ſhoot two unequal Stems, the one being as large again as the other. We have obſerved the ſame thing in the Feathers of the Neck and Belly of a *Parrot*, and in all the Feathers of a *Caſſowary*. *Belonius* reports that the Bird which he calls *Cock* of the *Wood*, and which he thought to be the *Tetrix* of *Ariſtotle*, has of thoſe ſorts of Feathers, and that he has not ſeen any other Bird have the like.

The *Eye* which was ſunk in the *orbite*, and covered with an Eminence of the *os Frontis*, which made as it were an advanced Eye-brow, was of a very brisk *Iſabella* colour, with the luſtre of a *Topaze*. The *Cornea* was raiſed with a great Convexity upon the *Sclerotica*, which made an edge elevated round the *Cornea*. This Border was hard and Bony. The *Conjunctiva* was of a very lively red. The *Eye-lids* were large each being capable of covering the whole Eye. Beſides the upper and lower Eye-lids, there was an Internal one, which was drawn into the great *Canthus* or corner of the Eye, and which being extended towards the little one, did intirely cover the *Cornea*.

Ariſtotle and *Pliny* do make ſix kinds of *Eagles*, which are the *Pygargus*, *Morphnois*, *Percnopteros*, *Melanaetos*, *Haliaetos*, and *Chryſaetos*; but they do not wholly agree in the Deſcription which they do make of them, chiefly in what concerns their ſize: in the reſt of the deſcription they could not be ſo different by reaſon of the names which the *Greeks* have given them, by which theſe Species are deſcribed, by attributing to them ſome Marks which diſtinguiſh them. Theſe marks have made us alſo to find out the Species to which we judge that our *Eagles* muſt be referred, as well by reaſon of the Particularities which do make them agree with theſe Species, as by reaſon that thoſe of the other Species are wanting in them. Thus we do think that two of our *Eagles* which were the leaſt, might be ranged under the laſt *Species*, which is the true *Eagle*, commonly called in *French*, *Royale*, by *Ariſtotle Gneſios*, and by *Ælian Chryſaetos* and *Aſterias*; by reaſon that the red, and as it were gilded Colour of the Plumes, is expreſſed by the Greek Name *Chryſaetos*; and that the ſpots which they have on the Belly and Thighs, do repreſent the Starrs ſignified by the Name *Aſterias*, which all Interpreters do report to have been given to this *Eagle*, only becauſe of theſe red ſpots. Moreover theſe *Eagles* could be neither the *Pygargus*, that is to ſay the white-tail'd *Eagle*; nor the *Morphnos*, that is to ſay the *Eagle* whoſe Plumage is of a dark Colour; nor the *Melanaetos*, that is to ſay the cole black *Eagle*; nor the *Percnopteros*, that is to ſay the *Eagle* whoſe Wings are ſpotted with black; nor the *Haliaetos*, that is to ſay the *Eagle* which reſides near the Sea, that is reported to have blewiſh Feet: Becauſe that theſe two *Eagles*, as appears by the Deſcription, had not the Tail white, nor the whole Plumage of a dark Colour, were not all black, nor had the Wings ſpeckled with black, nor the Feet blue; ſo that our great *Eagle*, which had the blueiſh Feet, might be the *Eagle* which abides near the Sea called *Haliaetos*, for this reaſon, beſides that it had the Wings very dark, as *Ovid* deſcribes it in the *Metamorphoſis* of King *Niſus*, who was changed into this Bird; that it had the Breſt and Belly white, according to the Deſcription of the *Haliaetos*, made by an *Anonymous* Author whom *Aldrovandus* cites; that its Feet were almoſt all covered with ſquare Scales, having a great many leſs ſquare than in the other *Eagles*; which *Belonius* affirms to be peculiar to this kind of *Eagle*, to which *Ariſtotle* attributes that which is ſpoken of all the *Eagles*, *viz.* that they do reject thoſe of their young which connot ſtedfaſtly behold the Sun.

Some difficulty might ariſe about the ſize which was indifferent in our two Royal *Eagles*, each not exceeding ſix pounds in weight; whereas the *Eagle Chryſaetos*, which *Aldrovandus* deſcribes weighed ten. But it muſt be conſidered that our *Eagles* were young, as appears by the white Feathers which they had upon the Neck, Wings, and Tail, which do change Colour in the *Eagles* when they do wax old, and do grow of a gilded or dark cheſtnut Colour, as *Geſner* has obſerved: Add moreover that it has been ſaid that *Ariſtotle* and *Pliny* agree not upon the ſize of the *Eagles* of different Species; *Ariſtotle* making that which he calls *Gneſios*, which is that which *Ælian* and *Pliny* do call *Chryſaetos*, the greateſt of all; and *Pliny* ſaying that it is only of a middle ſize, and that that which is called *Percnopteros*, is the biggeſt.

Pliny ſay's that Birds have no *Epiploon*: yet our two Royal *Eagles* had Membranes, which like a ſack did incloſe the *Inteſtines*, Liver and *Ventricle*; which *Corteſius* has likewiſe obſerved in making the Diſſection of an *Eagle*: We found ſuch an *Epiploon* in other Birds. This Membrane proceeded from thoſe which do form the Bladders which are in the lower Belly in Birds, and which do ſwell by Reſpiration. It had a great deal of Fat, eſpecially over the *Ventricle*, which might cauſe a belief, that this Fat had the ſame uſe in this Bird as in *Terreſtrial* Animals, where it is thought that it ſerves in the *Epiploon* to foment by its heat that of the *Ventricle*; at leaſt it is obſerved that *Carnivorous* Animals have the *Epiploon* furniſhed with a great deal of Fat.

The *Oeſophagus* which was on the right ſide of the *Aſpera Arteria* was extended even to two Inches and a half in Diameter, and ſix Inches in length when blown up, on the inſide. Towards the top there was a *glandulous* Body hard and firmly fixed to the Membrane; it was about the bigneſs of a Pea; it was found only in one of the Subjects. Underneath the place where the *Aſpera Arteria* was divided in two, the *Oeſophagus* was contracted, and did paſs underneath, then was enlarged to form the *Ventricle* which reſembled it in Size, Figure and Subſtance: For both the one and the other was compoſed of Membranes hard, white, and mixt with ſeveral Veſſels on the outſide. The inſide was different; the bottom of the *Oeſophagus*, which formed a *Crop* or *Craw*, was compoſed of ſmall *Glands*, which towards the bottom were about the bigneſs of a *Rape-ſeed*, and went continually leſſening, untill they inſenſibly became imperceptible. The *Ventricle* had ſome wrinkles, which multiplying towards the bottom, did render it thicker than towards the topp. Theſe two *Cavities*, as well that of the Breaſt, as that of the *Ventricle*, were very large, and proportioned to the *Voracity* of this Bird, which Naturalliſts report to be ſo extraordinary, that it ravages all the adjacent places, which do hardly ſuffice to furniſh it with the Prey neceſſary for its Nouriſhment. Thus it is obſerved that there are not found two *Eagles* in the ſame Quarter. *Ælian* reports that the *Eagles* not being ſatisfied with the great Birds that they do take, as *Cranes* and *Geeſe*, they do hunt *Rabits*, *Hares* and *Kidds*, which they take up, and carry away; and that they have even the Craft and Subtilty of killing *Bulls*, by making them to fall down *Precipices*, and then eat them, after that they are beaten in pieces by their fall.

The *Inteſtines* were ſmall, after the manner of *Voracious* and *Carnivorous* Animals, contrary to thoſe which do live only on Graſs, and eſpecially thoſe which do chew the Cud, where they are generally four or five times longer and broader than in others. In our two Royal *Eagles* they were ſlender and ſhort, and had no *Cæcum* in the Male. The Female had two, each being two Inches in length. In the *Eagle Haliaetos*, inſtead of the *Cæcum*, there were two ſmall Bunches hardly viſible on the outſide, but which had on the inſide two Pouches formed by *Tunicks* like *Valves*. The *Rectum* was ſuddenly contracted near the *Anus*, and afterwards made a Pouch of the bigneſs and ſhape of an Egg, at the Extremitie of which the *Ureter's* were inſerted: Underneath this Pouch there was ſeen the little Purſe of *Fabricius*, the Figure of which is repreſented in the Plate of the *Buſtard*.

The *Spleen* in the two Royal *Eagles* was round on the outſide, flat on the inſide and towards the *Ventricle*, to which it was immediately adherent: 'Twas on the right ſide that it was faſtened. It was eight Lines Diameter. Its Colour was a Red much darker than that of the Liver, which was of a very lively Red. Its Veſſels which it received from the *Porta* and *Arteria Cæliaca* were large and wide. In the *Eagle Haliaetos* it was ſeated under the right Lobe of the Liver, and knit to the third fold of the *Inteſtine* by the Branches of the *Vena Porta* and *Arteria Cæliaca*, as in the other two.

In this ſame *Eagle* the *Pancreas* was ſituated as in moſt Birds in the firſt fold of the *Inteſtine*, but it had a Figure altogether extraordinary. It was round at the lower end, making as it were a Head; the reſt was flatter and thinner. This Head was perforated to give paſſage to the *Ductus Hepaticus*, which without having any Communication with the *Ductus Pancreatici*, went to inſert it ſelf into the *Inteſtine*. The *Ductus Pancreatici* were in number three: there were two which were inſerted into the *Inteſtine* between the *Ductus Cyſticus* and *Hepaticus*; the third was joyned to the top of the *Hepaticus*. The Inſertion of theſe *Ductus*'s had two things particular; the firſt was that their inſertion was made into the *Duodenum*, whereas in Birds it is commonly into the Extremitie of the firſt doubling of the *Inteſtines*, which belongs to the *Jejunum*. The ſecond particular is that the Mouth of all theſe *Ductus*'s was each covered again by a little *Teat*, whereas generally there is but one *Teat* for all the *Ductus*'s, as well *Pancreatick* as *Cyſtick* and *Hepatick*. The *Pancreas* in the two Royal *Eagles*, was likewiſe ſeated very near the *Pylorus*, but it was faſtned to the *Inteſtine* by a *Ductus* ſo ſmall and ſhort, that it was hard to be ſeen: at the other end it clinged to the Spleen, which was faſtened and joyn'd to the upper part, and to the right ſide of the *Ventricle*, as has been already declared.

The *Liver* was a great deal bigger in theſe two *Eagles* than in the other: In both the one and the other the left Lobe was the largeſt. The *Gall-Bladder* was likewiſe very large in all the three, having the bigneſs and form of a great *Cheſt-nut*. It was joyned to the right Lobe of the Liver only by its Neck, which was a paſſage of a Line and half big. The *Ductus Cyſticus* proceeded from the bottom, over againſt the Neck. This Neck was joyned to the Liver after two different manners: for in the two Royal *Eagles* it hung to the end of the right Lobe which was the ſhorteſt, as has been ſaid: This was the reaſon that the Bladder was quite out of the Liver. In the other *Eagle*, the Neck was faſtened to the middle of the hollow part of the right Lobe as uſually.

In the two Royal *Eagles*, the *Kidneys* were ſmall, being only eight Lines Diameter: They were round and flatt, of a tawny Colour ſomewhat reddiſh. The *Eagle Haliaetos* had them almoſt like other Birds, which commonly have them very great in Proportion to other Animals, and of a particular Figure.

The *Teſticles* in the Male Royal *Eagle*, were two ſmall *glandulous* Bodies, ſhut up in *Membranes*. They were each of the bigneſs of a Pea, ſomewhat flatted, of a fleſh Colour inclineing to yellow.

The Females had the *Ovarium* and its *Ductus* as uſually in Birds, and ſuch almoſt as is deſcribed in the Figure of the *Damoiſelle* of *Numidia*.

The *Tongue* was *Cartilaginous* at the end, and fleſhy at the middle, having at its root two hard points like thoſe which are at the bottom of the Beard of an Arrow. It was five Lines broad, an Inch and two thirds long, from the Mouth of the *Larynx* to the end, which was not pointed as in moſt Birds which have the Beak ſtrait, but which was ſquare as in the *Parrot*.

The ſmall *Muſcles*, which faſten the *Aſpera Arteria*, did not take their Origine from the ſecond *Clavicula* as in the generallity of Birds, but from the internal part of the top of the *Sternum*.

The *Globe* of the *Eye* in the Female was in its greateſt breadth an Inch an half Diameter. That of the Male was three Lines leſs. The *Cornea* had a *Convexitie* which made it to riſe above the reſt of the Globe of the Eye, which was flatned before, as it is uſual in Birds and Fiſhes, which have not the Globe of the Eye ſo Sphærical as Terreſtrial Animals. The *Cornea* in one of the Eyes of the Male was not tranſparent but had an opake whiteneſs. Between the *Cornea* and *Chryſtallinus* in this Subject the whole *Aqueous* Humour was found hardned and as it were petrified, about the thickneſs of two Lines. This Cataract was placed in the *Iris*, which was of a minime Colour, and which ſeem'd to have been altered therefrom. The *Cryſtallinus* was four Lines and a half broad, and three and a half thick; being more convex on the inſide than the outſide. In the Female one of the Eyes was likewiſe ſpoiled, all the Humours and Membranes of the inſide being corrupted, ſo that the whole was diſſolved into a reddiſh water, without any appearance either of the *Cryſtalline*, *Aqueous*, or *Vitreous* Humour. The hole of the *Uvea* was cloſed by a thin, hard, and tranſparent Membrane. *Corteſius* who has obſerved this Membrane in the Eye of an *Eagle*, reports that it is found only in the Species called *Oſſifraga*, which *Ariſtotle* for that reaſon calls *Epargemos*, that is to ſay which has as it were a Cloud over the Eyes. Our *Eagle* was never the leſs very different from the *Oſſifraga*, which is not a true *Eagle*, but a kind of *Vultur*, whoſe plumage, according to *Ariſtotle*, is of a whitiſh Gray; which has not any reſemblance with our *Eagle*.

The *Optick Nerve* was in this Eye extraordinary ſoft and tender- The *Membrane* which is peculiar to Birds, and which proceeds from the Optick Nerve, makeing as it were a Purſe which go's to faſten it ſelf at the other end to the *Ligamentum Ciliare*, was very black, and even more than the *Choroides*. Altho' we called it a Membrane, becauſe that it appear'd a Membrane plaited, yet it was only a company of great black *Fibres*, which had ſome reddiſh ones in the middle, and which appeared to be Veſſels. The Optick Nerve from whence this Membrane did proceed, was flatted, makeing as it were a cleft three Lines long. The *Baſis* of this Membrane which was of a triangular Figure, had the ſame breadth, and five Lines from its *Baſis* to its point. The *Retina* was very thick and Opake, eſpecially all the bottom of the Eye, where it was plaited and wrinkled. In this place there was no *Tapetum* over the *Choroides*.

In one of our Subjects a Remark was made upon the ſtructure of the *Medulla Spinalis*, which was at firſt thought to be peculiar to this Subject, but which was afterwards diſcovered to be common to other Birds. It was found that towards the middle of the Back the exteriour part of the Marrow was divided and ſeparated in two, and afterwards rejoyned; the interiour part remaining intire, and being only dilated: which makes the Figure of a leaf. This ſeparation of the exteriour part, and this dilatation of the Interiour, was an Inch and half long, and eight Lines broad in this Subject, and in other Birds proportionably. We always found in the Cavitie which the two ſeparated parts do leave in the middle, a white and glutinous Humour, which appear'd to be the *Lymphatick* Humour condens't.

If the Principal uſe of the *Ventricles* of the *Brain* is to receive their Excrements, it may probably be ſaid, that this Cavitie which is peculiar to Birds, is as it were a *Ventricle* of the *Medulla Spinalis,* which being included within Bones, that have not a free Motion, ſuch as is that of the flexible *Spine* of other Animals, it wants the means which this Agitation might give it, to diſingage it ſelf of theſe Excrements, and diſſipate them ; ſo that it requires ſome Receptacle to receive them. This Conjecture will give us occaſion to ſearch whether there are any particular *Ductus*'s for the diſcharge of theſe Superfluities.

THE

The Explication of the Figure of the Indian Cock.

OF the two *Indian Cocks*, that is repreſented in the lower Figure whoſe Beak had no Bunch, but which had three points at the end; and which had no white Feathers at top of the Tail; becauſe that the other is found figured and deſcribed in *Aldrovandus*.

In the Upper Figure.

A. *Is one of the Feathers of the Creſt in its Natural bigneſs.*
B. *Another of the Feathers of the Creſt, whoſe* Fibres *are half ſhut up in a* Membranous Ductus.
C. *The Beak, which has no Bunch at top, of its Natural ſize, and divided into three at the end.*
Δ. *The Beak which has a Bunch.*
D. *The* Liver.
e. *The Oval* Gall-Bladder.
F. *The* Ramus Cyſticus.
g. *The two* Remi Hepatici.
H. *The ſingle* Pancreas.
I. *The* Ductus Pancreaticus.
K. *The* Aſpera Arteria *flatted, but leſs doubled than the other.*
L. *The* Aſpera Arteria *moſt doubled.*
M M. *The* Kidneys.
N N. *The* Aorta,
O P P. *The* Vena Cava, *which is divided into the Branches* P P, *laid on the* Kidneys, *to which they are faſtened, and do ſerve for* Emulgents.
Q Q. *The Branches of the* Aorta *which do make the* Crural Artery's
R R. *The* Ureters.
S T. *The* Vaſa Deferentia.
X X. *The* Teſticles.
Y Y. *The* Epididymides,
Z Z. *The extremitie of the* Rectum.
V. *The* Penis *faſtened to the* Rectum.
Γ. *The ſame* Penis *lifted up, to diſcover the hole of the* Rectum *which is between* Γ *and* Π, *and the* Aperture *of the ſack which is under the* Rectum, *which opening is underneath* Π.
Φ. *The* Anfractuous Gall-Bladder. *having the Figure of a* Cæcum.
α β. *The Two* Ductus Hepatici.
γ. *The* Ductus Cyſticus.
δ δ. *The Two* Ductns Pancreatici.
ε ε. *The right* Pancreas *which is under the* Meſentery.
ξ ξ. *The left* Pancreas *which is layd upon the* Meſentery.

THE

THE

ANATOMICAL DESCRIPTION

OF TWO

INDIAN COCKS.

THis Bird we call *Indian Cock* to diſtinguiſh it from that which is very common amongſt us, called *Cocq d' Inde* or *Turky-Cock*. It was brought from *Africa*, where we are told that it is called *Ano*. But becauſe that this Name is not known; that all the Authors which have ſpoken of this Bird have put it under the *Genus* of *Cocks;* and that *Gallus Indicus* is the name which *Longalius*, *Geſner*, and *Aldrovandus* have given it, *Johnſton* being the only perſon that calls it *Gallus Perſicus*; we have called it *Indian*, according to the opinion of the fore-cited Authors, and after the example of thoſe by whom the Bird which is thought to be the *Meleagris* of the Ancients, is called *Turky-Cock*, altho' it comes from *Africa:* add moreover that according to our conjectures the Bird which we ſpeak of, is found in the *Weſt-Indies*, where according to *Margravius* it is called *Mitu-poranga*, which *Benzo* in *Cluſius* Reports to be a kind of *Peacock*.

We diſſected two which were Males. *Aldrovandus* deſcribes the Female, and makes it in ſome thing different from the Male, which he ſaw only in Painting; and declares not in what ſtate he ſaw that Female. *Longolius* ſaw only the Skin of the *Indian Cock* which he mentions. The two which we deſcribe, differed from each other only in the Beak. They were about the ſize of a middling *Turkey-hen*. Their Plummage was perfectly black on the Head and Neck: all the reſt had a greeniſh Eye mixt with black, except the Back, whoſe Plumes towards the Root were of grayiſh Colour like the wood of a *Wall-nut*. The lower *Venter*, the top of the Thighs behind, and the under part of the Tail had white Feathers. *Margravius* ſays that the *Indian Cock* of *Brazile* is green, perhaps becauſe it is leſs brown than ours, and that the green inclines to a brown: but the deepneſs or faintneſs of Colour ought not to change a *Species*, when it is eſtabliſhed by more important Circumſtances, ſuch as are the things in which the *Indian Cock* of *Margravius* and ours do agree.

On the Head from the Beak to the beginning of the hinder part of the Neck, there was a Creſt or Plume of black Feathers, two Inches and a half long, two Lines and a half broad, erected, and a little leaning backwards, with their extremitie bent forward. The Neck towards the top was garniſhed with ſmall Feathers about the breadth of thoſe of the Creſt, but a great deal ſhorter, not exceeding four Lines in length near the Head: They increaſed in bigneſs as they approached the bottom of the Neck towards the Breaſt, even till they were two Inches long, and one broad.

The Feathers of the Tail were mixed, ſome being black, others white. In one of the Subjects there were white ones only underneath the Tail; in the other there were alſo white ones mixt with black at the top of the Tail. There were ſeveral of theſe Plumes whoſe Beards were ſhut up in a long quill or ſtem made of a very thin white Membrane, which ſomtimes incompaſt them even to the end, leaving only a ſmall Tuft to be ſeen. This Quill, where it lockt up the *Fibres* of the black Feathers, appeared blue, by reaſon that the Membrane was in ſome meaſure tranſparent. Some of the Feathers of the Wings and thoſe which did make the Creſt, were included in this Membranous Quill, which is likewiſe found in the Feathers of the Tail of *Turkey-Hens*. All the Thighs were covered with Feathers.

The *Neck* was nine Inches long. From the under part of the Belly to the extremitie of the Feet extended were fourteen Inches. The *Feet* were great and ſtrong. The *Leggs* were covered before and behind with large ſquare Scales. At the ſides they were ſmall, not exceeding half a Line, of an *Hexagonal* Figure. The *Talons* were black, long, and crooked. Behind the Legg there wanted that Spurr which is peculiar to *Cocks*.

The *Beak* was large, being nine Lines broad at its beginning, and two Inches long. Towards the end it was black, and very hard; the reſt was yellow and covered with a Membrane, which was ſo ſwelled in one of the Subjects, that it made a round and high Bunch, about the bigneſs of a ſmall Nutt, and after the manner as *Aldrovandus* Figures it. That which had not this Bunch had the end of the Beak divided in three, as if it had been three Beaks joyned together.

The *Liver* in both the Subjects, was of a brisk red Colour, and of a Subſtance very ſoft. It was divided into two Lobes: the right was biggeſt, the left longeſt. The *Gall-Bladder* was almoſt in the middle of the two Lobes, but more faſtened to the left ſide than the right. In one of the Subjects it was *Anfractuous*, and of the Figure which is attributed to *Tears*; which divided it into three little *Cells*. It was joyned at the top to the ſurface of the Liver, by the means of its exteriour *Tunick*, which it borrowed from the *Capſula*, and at the bottom to the *Inteſtine*, which ſupplyes the place of the *Jejunum*. Its Colour was green, its length an Inch, and its bigneſs half an Inch.

The *Ductus Cyſticus* in this Subject, proceeded from the upper part of the Bladder, and deſcended ſtraight downwards, to inſert it ſelf into the Poſteriour part of the *Inteſtine*: It was about the bigneſs of a *Hens-quill*, and about an Inch long. There were two *Ductus Hepatici*, which in Birds is very rare. They both came out of the ſide of the *Vena Porta*. They were of different ſizes, the one being as bigg as the Quill of a *Hen*, and the other ſcarcely equalling a middle ſized pin. They deſcended in a right Line the length of an Inch, and penetrated the *Inteſtine* very near the inſertion of the *Cyſticus.*

In the other Subject the *Bladder* was ſmaller, of an oval Figure. The *Ductus Cyſticus* proceeded from the middle of the Bladder: There were likewiſe two *Ductus Hepatici,* which were inſerted into the *Inteſtine* after the ſame manner as in the other Subject: But all theſe *Ductus bilarii* were leſſer than in the Subject where the Bladder was *Anfractuous.*

The *Pancreas* which was found double in one of the Subjects, was placed as uſually in Birds, in the Interval of the firſt Circumvolution of the *Inteſtines,* which makes a Sinuoſity, at the bottom of which theſe two *Pancreas's* took their *Origine*; and the one, *viz.* the right, paſſing under the *Meſentery,* and the other above, aſcended to faſten themſelves to the left part of the Liver, and to the *Pylorus.* From this place they did each ſend forth a very fine *Ductus,* ſix Lines long, which inſerted it ſelf near the place of the three *Cholidochi.* Theſe five holes wherewith the *Inteſtine* was in this place pierced by the three *Cholidochi* and two *Pancreatici,* did all meet under the wrinkle, which the *Inteſtine* makes, to form as it were a *Caruncle.* The glandulous Subſtance of the *Pancreas* was of a pale red: they were thin towards their *Origine,* but very thick at their extremity towards the Liver. The other Subject had but one *Pancreas,* and one ſingle *Ductus.*

The *Oeſophagus,* which was very ſtrait, and not exceeding half an Inch in compaſs, was dilated towards the entrance of the *Thorax,* to forme a *Craw* which was four Inches in circuit, and an Inch in length. After its being thus dilated, it was contracted, and paſſing through the *Thorax,* was again dilated to form as it were a *Ventricle,* furniſhed with *Glands* which had the Figure and ſize of a grain of *Rye*: they were ranged like thoſe which are deſcribed in the *Buſtard.* The fleſhy *Tunicle* of this *Ventricle* was very thin. The *Gizzard,* which was two Inches and a half in length, and two in breadth, had nothing remarkable, excepting that its fleſhey part was very thin, and its Velvet covering very thick, hard, and brittle like Glaſs. This hardneſs hapning to this coat of the Gizzard of the *Indian Cocks,* when being ſeparated from the Gizzard, they are left ſome time a drying; but in theſe Subjects, they were found thus hardned at the opening of the Body, and being ſtill freſh.

The *Inteſtines* were of an extraordinary length, *viz.* twelve Foot; and each *Cæcum* ſix; but their Cavitie was very ſtrait, not exceeding a Line in Diameter. In the *Anus,* at the extremitie of the *Rectum,* there was a hole two Lines broad, which was the mouth of a Sack five Lines in length, and three in breadth. This Sack which was under the R*ectum,* is deſcribed in the *Buſtard.*

The *Teſticles* were ſeated on the *Aorta,* at the ſuperiour part of the Kidneys: their Subſtance was glandulous, of a pale red. They were five Lines long and two broad; and at their lower part there was ſeen another Gland abſolutely black, which was ſtrongly faſtened to them: 'Twas the *Epididymis,* which through its lower extremitie ſent forth a very fine *Ductus,* which was the *Deferens,* which running along the *Vena Emulgens,* was changed into a very thin *Tunicle.*

The *Penis* was placed at the lower part of the *Anus*, oppoſite to the Rump. Its Figure was *Pyramidical*, being four Lines long, and three Lines broad towards its *Baſis*. It was compoſed of two hard and nervous Bodies, clad with ſeveral ſmooth and ſpongeous Membranes. There was alſo ſeen ſome muſculous Fleſh, which faſtens it ſelf at its *Baſis*.

The *Kidneys*, which were ſpeckled with ſeveral ſmall points, ſome white, others minime, made us to apprehend that their Subſtance,conſiſts of a number of conglomerated Glands. They were, as uſually in Birds, cut in ſeveral deep compartments and diviſions, each Kidney being two Inches and a half in length and ten in breadth. The *Amulgent Veins* and *Arteries* had their diſtribution as ordinarily, and the *Ureters* inſerted themſelves at the extremity of the *Rectum*, after having run along the exteriour ſurface of the Kidney.

The *Aſpera Arteria* in one of the Subjects deſcended in a ſtrait line to the middle of the *Craw-Bone*, which terminates the top of the *Thorax* in Birds, where it was dilated and faſtened. There turning it ſelf backwards, it made a fold reaſcending an Inch and half in heigth, and faſtening it ſelf by a very ſtrong Membrane to the very place of the *Craw-Bone*. From thence it deſcended into the *Thorax*. In the other Subject it made not ſo great a fold, but it was dilated after the ſame manner. This dilatation was two Inches and a half in Circumference, being not an Inch in any other part.

The *Heart* was very ſmall, not being an Inch in length and half an Inch at its *Baſis*: its point was very ſharp. The Cavitie of the fleſhy *Valve* which is at the mouth of the *Vena Cava* in Birds, was a Line in depth.

The *Globe* of the *Eye* meaſured ten Lines in Diameter, and the *Cornea* five. The *Cryſtalline* was more convex behind than before: It was three Lines Diameter. The *Vitrious Humour* was of a very hard Conſiſtance. The *Choroides* was all over black, even over the *Tapetum*, where were ſeen none of the Colours which are commonly there. The *Iris* was of a dark red. The *Sclerotica* was hard and Cartilaginous at the fore part, according to the nature of *Birds* and *Fiſhes*. The *Optick Nerve* was ſide-ways; and after having pierced the *Sclerotica* and *Choroides*, was inlarged, and formed a Circle, from the Circumference of which there went ſeveral black fillets, which were united to form a Membrane that we have found in all Birds, and which is deſcribed in ſeveral places of theſe *Memoires*.

The

The Explication of the Figure of the Buſtard.

THe Six *Buſtards* were not in all things alike. There were ſome whoſe Neck was proportionably longer than the Leggs; others had it ſhorter. Some had the Beak more pointed than it is here deſcribed; yet the Generality had it thus. There was one where the Feathers which covered the Ear were ſomewhat longer than they are here repreſented.

In the Upper Figure.

AA. *The two* Lobes *of the* Liver.
B. *The* Gall-Bladder.
C. *The* Ductus Cyſticus.
DD. *The* Ductus Hepaticus.
EF *The* Ductus Pancreatici.
G. *A fold of the internal Tunicle of the Inteſtine, forming a* Caruncle *or Teat, which cover's the four Mouthes of the* Cyſtick, Hepatick, *and* Pancreatick *Branches.*
HH. *The* Pancreas.
I. *The extremity of the* Oeſophagus *where it begins to inlarge it ſelf.*
KKK. *The outward membrane of the* Oeſophagus *which is common with the* Oeſophagus *and* Ventricle, *or* Gizzard *which it covers.*
LL. *The Internal* Membrane *which cover's the* Gland's *of the lower part of the* Oeſophagus. *This* Membrane *is alſo covered with another which makes the Velvet, and which is likewiſe extended over the* Membrane M M. *It is not here repreſented, to avoid Confuſion, and becauſe it is eaſily ſupply'd by Imagination.*
MM. *The Internal* Membrane *of the* Gizzard, *which is folded and rufled.*
N. *The* Glands *which are at the bottom of the* Oeſophagus *like to the ends of Pipes, and ranged one upon the other.*
OO. *The Fleſhy and* Muſculous *part of the* Gizzard, *incloſed between the* Membrane K K K, *and the* Membrane M M.
P. *One of the Feet repreſented at large, altho,it exceed not a third part of the Natural bigneſſe.*
p. *One of the* Talons *cut, to ſhew that it is not hollow underneath, but round as at top.*
Q. *The extremity of the* Ilium.
R R. *The beginning of the two* Cæcum'*s.*
S S. *The great* Pouch, *which is near the Extremity of the* Rectum. *It is opened, to diſcover the mouths of the* Ureter'*s and of the third* Cæcum.
T T. *The* Ureters.
V. *The third* Cæcum *commonly called* Fabricius, Purſe.
X. *The mouth of the third* Cæcum.
Y. *A fold of the internal* Membrane *of the great Pouch of the* Rectum, *making a little Sack over the Mouth of the* Purſe.
Z Z. *The mouths of the* Ureters.

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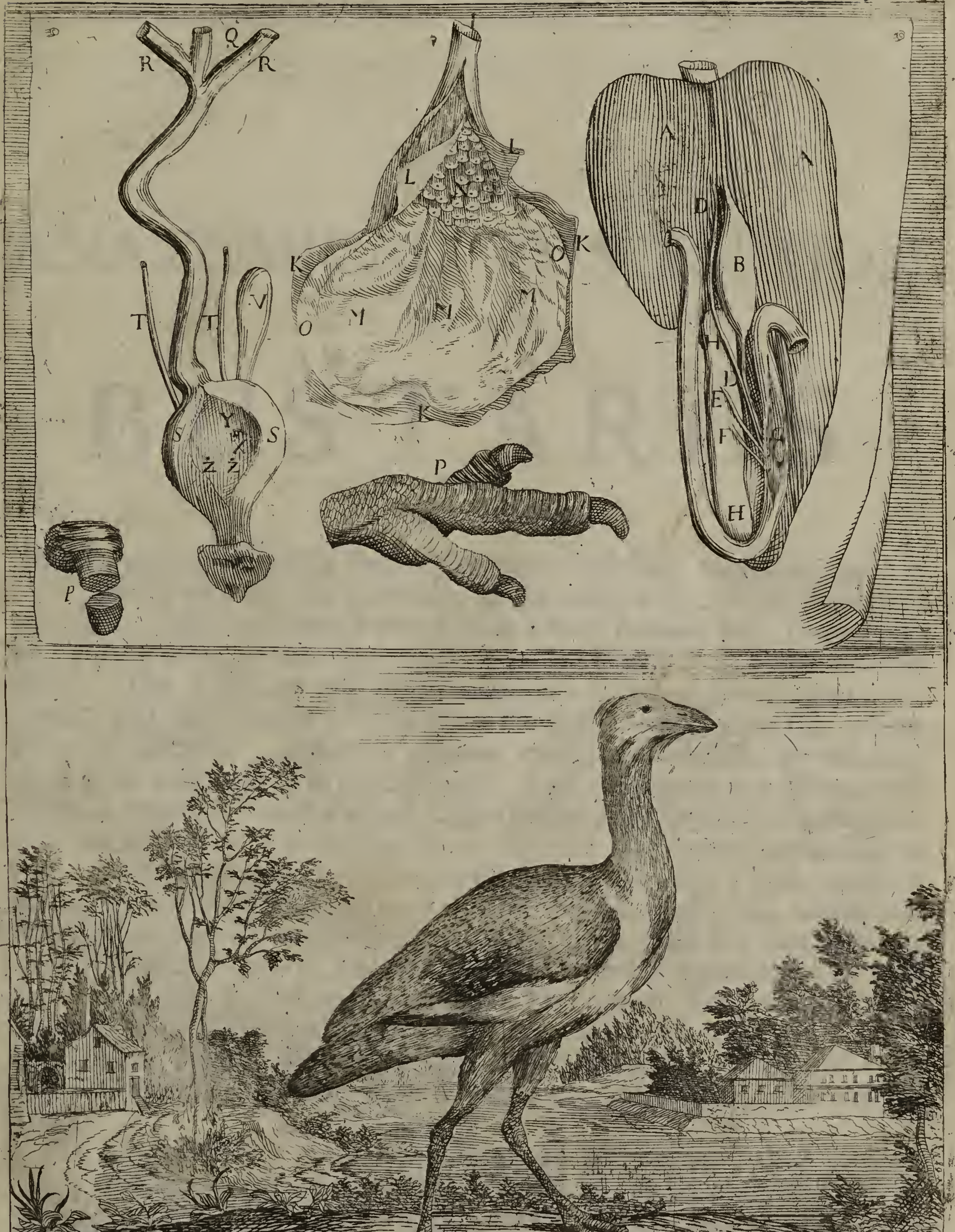


THE ANATOMICAL DESCRIPTION OF SIX BUSTARDS.

THe greateſt of the ſix *Buſtards* which we diſſected, comprehended but three Foot from the extremity of the Beak to that of the hind Feet extended. This ſize comes not near that which *Belonius* and *Turnerus* allow to the *Buſtard*, which they report to be the largeſt of all Fowl next the *Oſtrich*. The *Caſſowary* and *Griffon* which we diſſected, were a great deal bigger; and other Authors do not make the *Buſtard* larger than that which which we deſcribe. *Ariſtotle* in *Athenæus* makes it much leſs; for he compares it, as to its bigneſs to a great Cock. And it is ſtrange that *Belonius* and *Turnerus*, who had ſeen *Buſtards*, ſhould, to follow *Pliny*, ſpeak ſo of it, that they ſeem not to have well underſtood him: For the Bird, which according to *Pliny*, is the largeſt next the *Oſtrich*, is the ſecond *Species* of *Tetrao*, which is not the *Buſtard*; and *Pliny* ſays only that the bigneſs of the *Otis*, which is evidently our *Buſtard*, approaches that of the *Tetrao*: But it is not certainly known what the *Tetrao* is, and what he ſpeaks thereof agrees not at all with the *Buſtard*; this Bird according to *Pliny*'s Deſcription, being black all over the Body, except the Feathers over the Eyes, which are red: which is not found in the *Buſtard*, who has indeed ſome red and ſome black, or ſome brown in its Plumage, but theſe Colours are there placed after another faſhion.

The *Neck* and *Feet* were much longer in our *Buſtards*, than in thoſe which *Geſner* and and *Aldrovandus* have deſcribed: as for the reſt they do well enough agree with the Deſcription which theſe Authors do make thereof. Their Neck was a Foot long, and their Leggs a Foot and half. The Wings were hardly longer than the Leggs; ſo that being extended, they exceeded not four Foot; which has no proportion with the Maſs of the reſt of their Body. Therefore it is that this Bird fly's with ſo much difficulty that it may eaſily be overtaken in its flight. *Oppian* ſay's that of all Birds the *Buſtard* only is afraid of Doggs, becauſe that it raiſes it ſelf ſo little from the ground, and go's ſo ſlowly, that they can eaſily catch it.

'Tis upon this account that it has been by the *Latins* called *Avis tarda*, from whence is derived the word *Otarde* in *French*, unleſs it be taken from its *Greek* Name, which is *Otis*; altho the Ancients have ſpoken very variouſly of the *Otis*, to make it doubted whether it is our *Buſtard*. *Albertus* calls it *Biſtarda*, and gives to that *Epithete*, ill borrowed from *Avis tarda*, an *Etymologie* much worſe; for he thinks it is ſo named, becauſe that it generally makes two leaps when it begins to fly.

The *Plumage* was of ſix Colours; *viz.* white, black, aſh-colour, brown-gray, and roſe-colour. The Belly, Thighs, under-part of the Tail, and Wings were white. It is probable that *Belonius*, who makes the top of the Wings white in the *Buſtard* is miſtaken; becauſe that generally Birds which have any dark Colour in their Plumage, have it ordinarily on the Wings and Back: Which is obſerved in other Animals, which have the Back alſo browner than the Belly. The fore-part of the Neck, the Head, and middle of the upper part of the Wings were of an aſh-colour. The hinder part of the Neck, the Back, the upper part of the Wings near the top, and the top of the Tail were red ſtreak't with black, long, unequal, and as it were interrupted ſpots, as in *Partridges*. This made us to think that *Ælian* intended to ſpeak of the *Buſtard*, when he ſay's that in the *Indies* there are *Partriges* as bigg as *Geeſe*. The extremities of the Wings were of a dark-gray. All the Feathers in general, excepting the great ones, which are at the end of the Wings, had near the skin a down of a very lively red, inclining to a roſe-colour. The Quill was alſo of this ſame Colour at the end. There were ſome of the Feathers which, (beſides this Down faſtened to the bottom of the Quill, had another, which after a very extraordinary manner, proceeded from their extremitie, the middle of the Feather being compoſed of firm Beards claſped to each other, as they are in Feathers which do ſerve for flying, and the reſt being as it were ſplitt and divided into an infinite number of very ſmall *Fibres*.

The *Beak* was of a ſomewhat darker-gray than the Plumage of the Head. It was three Inches long from the Eye to its extremitie. It had almoſt the ſhape of a *Turky-hens* Beak, and reſembled not, as *Geſner* reports, the Beak of the *Eagle*, which is very crooked.

The *Leggs* and almoſt half the *Thighs* were covered with little ſmall Scales of an *Hexagonal* Figure, the greateſt of which exceeded not one Line every way. The *Toes* of the Feet were covered at top with ſquare, long and ſtrait Scales. All the Scales were of an aſh-colour, covered over again with a ſmall Skin which was raiſed like the *Heckle* of a *Serpent*. The bottom of the *Foot* was covered with a Skin ſpeckled like *Chagrine*. The *Toes* were in number only three. The hinder one was wanting, and in the place thereof, there was a *Calloſitie* about the bigneſs of a ſmall Nut. The greateſt of the *Toes* was two Inches nine Lines long. The *Talons* were large, ſhort, a little crooked, ſomewhat pointed, and almoſt like to the Nails of Man, being of an oval Figure: but what they had moſt remarkable, is that they were convex underneath as well as at top; which rendered their Section *Lenticular*. *Belonius* ſays that the kind of *Eagle* called *Haliaetos*, has its Talons round underneath, as well as at top, contrary to the nature of the Claws of other Animals, which are hollow, or at leaſt underneath.

The *Buſtard* do's not build its Neſt on Trees, according to *Albertus*, becauſe it cannot fly : but it is probable that it is becauſe it cannot ſtand there, by reaſon of the extraordinary make and ſtructure of its feet, which is incommodious for that purpoſe, having no hind Toe, and the ſole of the Foot being made round and filled with a great *Calloſity*, which hinders it from being able to Perch.

Ariſtotle ſays that the *Otis* in *Scythia*, ſits not on its Eggs like other Birds, but that it invelops and wrapps them up in a *Hares* or *Foxes* Skin, and hides them at the root of a Tree, at the top of which it Perches, to watch for the Fowlers, whom it hinders from approaching, by ſtrikeing them with its Wings, as *Eagles* do : which demonſtrates that the word *Otis* is very ambiguous amongſt the Antients, and that it ſometimes ſignifies our *Buſtard* and ſometimes another Bird, which is very different therefrom : for the *Buſtard* is incapable either of Perching on a high Tree, or of fighting with the Fowlers.

The hole of the *Ear*, whoſe greatneſs ſome pretend has given the Name to this Bird, had nothing extraordinary. In ſome of our Subjects it was covered with Feathers ſomewhat longer than the reſt : but they made not ſuch long Ears as in the *Demoiſelle* of *Numidia*, which, according to our conjectures, is the true *Otis* of the Ancients, and that it is confounded with the *Otis*, as is ſhewn in the Deſcription of the *Demoiſelle* of *Numidia*.

The *Liver* was very large, the right *Lobe* in ſome of our Subject being five Inches ; ſo that it deſcended to the bottom of the Belly. It was of a firm Subſtance, and of a Vermilion Colour.

The *Gall-Bladder*, which was hid under the right *Lobe*, was faſtened to the Liver only by its upper part, which was as it were its Neck: the reſt hung down being looſened from the Liver, and adhereing below to the *Jejunum*. It was two Inches and a half long, and an Inch broad, being of an oval Figure. The *Ductus Cyſticus* in ſome of our Subjects was ſhort, becauſe that it proceeded from the bottom of the Bladder, and joyned it ſelf to the upper part of the *Jejunum*. In others this *Ductus* was longer, becauſe that it came from the the upper part of the Bladder, near its Neck, and was inſerted into the ſame place as the others which were ſhorter. The *Ductus Hepaticus* came out near the Neck of the Bladder, and was alſo fixed to the *Jejunum*, two Inches lower than the *Cyſticus*, only in the Subjects where the *Cyſticus* proceeded from the Neck of the Bladder ; in others it was immediately inſerted underneath the *Cyſticus*, as it is commonly in Birds.

The Subſtance of the *Spleen* was quaggie, and of a dark red. It was made like the Kidney of *Terreſtrial* Animal : it was only ten Lines long, and ſix broad.

The *Pancreas* was placed in the firſt Circumvolution of the *Inteſtines*, into which it deſcended as uſually. Its Subſtance was hard, and of a pale red : it was very thin at one end and very thick at th'other, from whence its *Ductus* proceeded, which was but five Lines long. In one of our Subjects there was two *Ductus Pancreatici*, which came from the *Pancreas* : In another there were two *Pancreas*'s, which had each their *Ductus*. Theſe *Ductus*'s *tus*'s were all inſerted near the *Cyſtici*, having each a ſeparate entrance ; but they were all covered with an Appendix like a Caruncle, which appeared to be a fold of the Internal Membrane of the *Inteſtine*.

Ariſtotle in *Athenæus*, remarks that the *Buſtard* has no *Craw*. In our Subjects the *Oeſophagus* was every where ſtrait : it was inlarged only, and ſomewhat thikned before it joyned with the Gizzard, for about the ſpace of two Inches. In this place there was a great quantity of Glands incloſed between the two Membranes of the *Oeſophagus*. Theſe Glands were ranged like Honey-Combes : each was peirced lengthwiſe, forming a little *Tube* or *Ductus*. The Figure of the whole Gland was Conical, and about the thickneſs of a Line at one end, and of the length of two, terminating in a point. Theſe Glands were laid one upon the other, ſo that the great end only appeared, where was the mouth of the little *Ductus*. The internal Membrane of the *Oeſophagus*, which was laid upon theſe ſmall Glands, was ſo thinn, that they were ſeen through it, and that when they were preſſed, they ſent forth a Liquor which likewiſe paſſed through the Membrane. This Membrane was alſo covered with another, which was extended over the whole Cavitie of the Gizard, as well as over that of the enlargement of the *Oeſophagus* where the Glands were. This laſt Membrane ſupplyed the place of the Velvet, which generally covers the inſide of the *Ventricle* of Animals.

This Structure of the lower part of the *Oeſophagus*, and this heap of Glands is found in moſt Birds, but is not commonly ſeen ſo plainly and diſtinctly as in the *Buſtard*. *Arantius*, who has made the Diſſection of a *Buſtard*, calls theſe Glands of the *Oeſophagus*, *Carunculæ* ; and ſay's that they are round ; but it is probable that he ſaw thoſe Glands only through the Internal Membrane, which offers to view only the great end of each Gland, which is round ; the reſt, which is extended, and makes a point, being hid under the other Glands.

The *Gizard* was four Inches long, and three broad. Before its opning it appeared very like to the Gizard of Hens, by reaſon of its hardneſs, which in Hens proceeds from the thickneſs of the fleſhey part : but in all our *Buſtards*, this fleſhy part was very thin, not exceeding a Line in thickneſs ; and the whole hardneſs which was obſerved in this Gizard before it was opned, proceeded ſolely from the Internal Membrane, which was not only thick and hard, but which had Folds and Ruffs in ſeveral manners ; each Ruff being frizled and refolded, which took up a great deal of roome.

This folded and ruffled Membrane on the inſide of the Gizard, was of a gold Colour, and had no continuity with the Membrane extended over the Glands of the Craw which was white ; but it was ſeparated from it like the Seams of a Lining of a Garment ſowed together : It was likewiſe eaſily ſeparable from the fleſhy part of the Gizard.

This *Gizard* was filled with Stones and Doubles : There were ſome Stones about the bigneſs of a Nut. In one of the Subjects there was found ninety Doubles, worne and poliſh'd by their mutual rubbing, and by that of the Stones which were mix'd therewith, without any appearance of Corroſion ; which it was eaſie to judge, for that they were worn only in their Gibbous and Eminent parts, the hollow parts remaining intire and without Poliſhing, becauſe that they could not be touched and rubbed like the others. There was not likewiſe ſeen any mark or ſign of Corroſion in theſe parts, being neither ruſty, rough, nor uneven. In one of the Subjects the *Ventricle* was found filled with a great quantity of Hay. *Athenæus* ſay's that *Buſtards* do chew the Cud. In a *Parrot*, which is a Bird that is obſerved to Chew over again what it has already ſwallowed, we have remarked two *Ventricles* ſeparated one from the other by a long *Ductus* or Paſſage; which ſeems to be made for the uſe of Rumination: But we have found no ſuch thing in the *Buſtard*.

The *Inteſtines* meaſured four Foot in length, without reckoning the two *Cæcums*, of which the right was a Foot, and the left eleaven Inches; which is no great lengh for an Animal that eats Hay. The two *Cæcums* proceeded as uſually from the place where the *Colon* is joyned to the *Ilium*, ſeaven Inches diſtant from the *Anus*. They tended not from the top downwards, as *Arantius* reports he obſerved it; but from the bottom upwards, as it is found in other Birds. The internal Tunicle of the *Ilium* was folded lengthwiſe, after the manner of the laſt *Ventricle* of Animals which chew the Cud: towards the extremity of this *Inteſtine* it had ſome croſs wrinkles which ſupply'd the place of the Valve of the *Colon*.

About an Inch diſtant from the *Anus*, the *Inteſtine* was contracted, and afterwards dilated, making a Pouch capable of containing an Egg. The two *Vreters* were inſerted into this Pouch. Towards its middle there was diſcovered a little hole, which led into a Sack which was as it were a third *Cæcum*, which is vulgarly called the *Purſe* of *Fabritius*, from the name of him who firſt deſcribed it. This *Purſe* or Sack was two Inches long, and three Lines broad at its beginning, where it was a little ſtraiter than towards its extremitie. Over the hole, which from the middle of the Pouch penetrated into the third *Cæcum*, there was a fold of the internal Membrane of the Pouch, which ſerved apparently for a Valve capable of hindering the reflux towards the top of the *Rectum*, and of favouring the entrance into the third *Cæcum*.

This obſervation of a third *Cæcum*, is contrary to what *Ariſtotle* has remark'd in the *Inteſtines* of the *Buſtard*, which he reports to have leſs *Appendices* at their lower extremity, than other Birds uſe to have.

The *Kidneys* were three Inches long: They were very deeply cut in three Lobes, after the manner of Birds. Their Veſſels were likewiſe diſpoſed as in other Fowl, except the two *Crural Arteries*, which are generally double, and which commonly paſs underneath the Kidneys: For in our Subjects there was one which paſſed over, and another which paſſed under, to go into the Thigh.

Each *Teſticle* was ſix Lines long and two broad, being of the ſhape of a ſmall Almond, of a Subſtance very firm, and white. The *Epididymis*, which was perfectly black, and of the ſame Figure of the *Teſticle*, contained four Lines in length and two in breadth. Beſides the two *Teſticles*, in one of our Subjects there was found a *Glandulous* Body, which ſeem'd to be a third. It was nine Inches long, and ſix broad, of an Olive Colour. The *Ductus Deferens*, which proceeded from the extremity of the *Epididymis* of each of the true *Teſticles*, paſt over the *Vena Emulgens*, to which it was faſtened, and deſcended upon the Kidney along the *Vreter*.

At the upper lip of the *Anus*, there was a little Appendix, which ſupplyed the place of the *Penis*. Amongſt ſo many Subjects of this kind which we have diſſected, there was never a Female.

The *Tongue* was not Bony, as *Ariſtotle* deſcribes it in *Athenæus*: It was Fleſhy on the outſide, having on the inſide a *Cartilage* faſtened to the *Baſis* of the *Os Hyoides*, as in the generallity of Birds. Its ſides were rough with ſome prickly parts of a Subſtance between a Membrane and a Cartilage.

The *Rings* of the *Aſpera Arteria* were entire- In ſome of the Subjects there was on each ſide a *Caruncle* or red Gland, immediately faſtened to the *Aſpera Arteria,* and to the *Carotides*, by the means of a branch about the bigneſs of a great Pin; which is very common in Birds.

The *Heart* was two Inches and a half bigg. The Sack which formes the fleſhy Valve, which is commonly found in the right *Ventricle* of the Heart of Birds, at the entrance of the *Vena Cava*, was four Lines deep. The fleſh of the left *Ventricle* was four Lines thick towards its *Baſis*, and one towards its Point.

In the Eye, the *Sclerotica* had a Cartilaginous edge before, about a Line broad, which made as it were a Circle about the *Cornea*. The *Vvea* was reddiſh and overſpread with a great number of Arterys, Veins and Nerves. The *Iris* was of an Iſabella Colour. The *Cryſtalline* was three Lines Diameter; the whole Globe of the Eye nine.

The *Optick Nerve* having penetrated into the inſide of the Eye, was flatned, and formed a white edge of an oval, long and ſtrait Figure; from whence proceeded the black Membrane in form of a Purſe, which faſtened it ſelf to the ſide, towards the edge of the *Cryſtalline*. This Membrane is more particularly deſcribed and repreſented in the Deſcription of the *Oſtrich*.

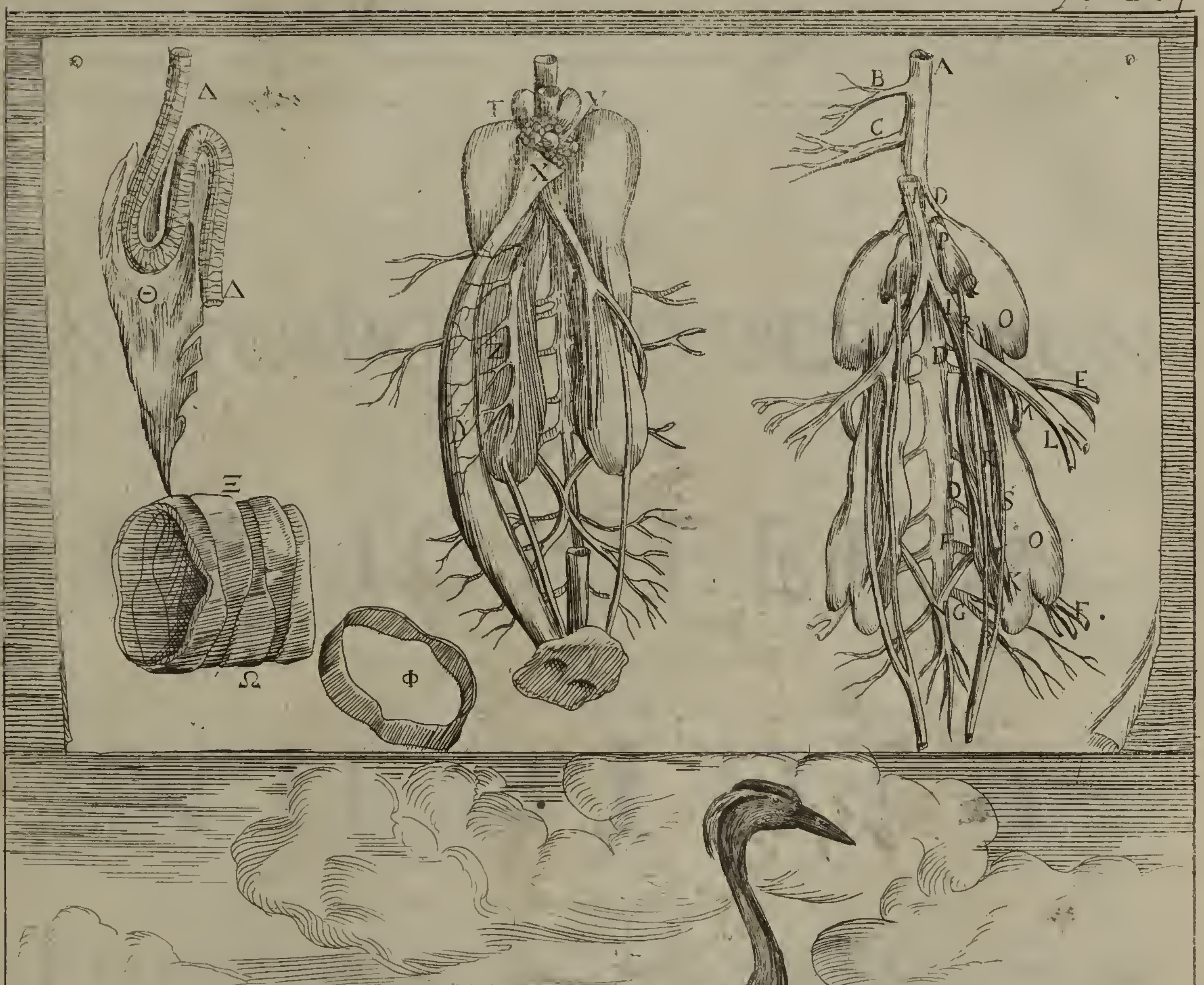
In the *Palate* and lower part of the Beak, which is as it were a lower Jaw, there was under the Membrane which covers theſe parts, ſeveral glandulous Bodys, which did open into the Cavity of the Mouth by ſeveral very viſible Tubes.

The Explication of the Figure of the Demoiſelles *of* Numidia.

THe lower Figure repreſents what kind of long white Feathers do ſtand up like Ears on both ſides of the Head of this Bird; and how the brown, long, and looſe Feathers, do hang down to the bottom of the Neck. But that which is moſt remarkable, is the Poſture, in which it is put, by repreſenting it as if it danſed; becauſe that this Action is proper to it.

In the Upper Figure.

A. *The Trunck of the* Aorta.
B. *The* Arteria Cæliaca *which goes to the Ventricle, Spleen, and Liver.*
C. *The* Meſenterica, *which goes to the* Pancreas *and* Inteſtines.
D D D. *The* Arteriæ Emulgentes.
E E. *The* Cruralis Superior.
F F. *The* Cruralis Inferior.
G. *The extremity of the* Aorta *which is diſtributed to the* Os Sacrum *and the adjoyning Parts.*
H. *The Trunck of the* Vena Cava.
I. *The* Ramus Iliacus *of the* Cava.
K. *The* Vena Emulgens.
L. *The* Vena Cruralis.
M. *The Trunck of the* Cruralis *which paſſes under the Kidney, and joyns at* N *to its fellow.*
O O. *The left Kidney.*
P. *The Teſticle of the Male.*
Q. *The* Epididymis.
R R. *The* Vaſa Spermatica Deferentia.
S. *The Vreter.*
T. *The Teſticle of the Female.*
V. *The* Ovarium.
X Y. *The* Oviductus.
X. *The Funnel of the* Oviductus.
Z. *A Ligament which faſtens the* Oviduct *to the Kidney, like a Meſentery.*
△ △. *The bending of the* Aſpera Arteria.
Θ. *The Bone of the* Sternum, *in which the Circumvolution of the* Aſpera Arteria *is held faſt.*
Φ. *One of the Rings of the* Aſpera Arteria *having two Notches.*
Ξ Ω. *A Piece of the* Aſpera Arteria *which diſcovers the manner how its Rings are interwoven.*
Ξ. *The Part which reſpects the* Vertebræ *of the Neck.*
Ω. *The Part which reſpects the outſide of the Neck.*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THE ANATOMICAL DESCRIPTION OF SIX DEMOISELLES OF NUMIDIA

THis *Bird* is ſo called, by reaſon of certain ways of Acting that it has, wherein it ſeems to imitate the Geſtures of a Woman, who affects a Grace in her Walking, Obeiſſances, and Danſing. This reſemblance muſt be thought to have ſome reaſonable ground, ſeeing that for above two Thouſand Years the Authors which according to our Conjectures, have treated of this Bird, have deſigned it by this Particularity of the imitation of the Geſtures and Behaviours of Man. *Ariſtotle* gives to it the Name of *Actor* or *Comedian*. *Pliny* calls it *Paraſite* and *Danſer*. *Athenæus* Names it Ἀνθρωποειδὴς, that is to ſay, having humane Form, by reaſon that it imitates what it ſees Men do, and not becauſe that it imitates the Speech of Man like the *Parrot*, as *Gellius* underſtands it. For *Athenæus* relates the manner, which as *Xenophon* reports it, the Fowlers make uſe of to take theſe Birds, which is by rubbing their Eyes in their Preſence, with Water put into Veſſels which they do carry away, leaving ſuch like Veſſels filled with Glue, wherewith theſe Birds do glue their Feet and Eyes, when they endeavour to imitate what they have ſeen other done.

It is probable that this *Danſing* or *Buffoon* Bird, was rare amongſt the Ancients, becauſe *Pliny* thinks it fabulous, by ranging this Animal, which he calls *Satyrick*, amongſt the *Pegaſus*'s, *Griffons*, and *Syren*'s. It is likewiſe credible, that till this time it was unknown to the Moderns, ſeeing that they have not ſpoke thereof as having ſeen it, but only as having read in the Writings of the Ancients the Deſcription of a Bird called by the *Greeks*, *Scops* and *Otus*, and by the *Latins Aſio*, to which they had given the Name of *Danſer*, *Actor*, and *Comedian*. So that the Matter in Queſtion is to ſee whether our *Demoiſells* of *Numidia* may paſs for the *Scops* of the Ancients.

The Deſcription which they have left us of the *Otus* or *Scops* conſiſts in three remarkable Particulars, which are ſeen in the *Demoiſelle* of *Numidia*, altho' it is not found that any of the Moderns have deſcribed it, and that it has relation to any of the Birds whereof the Ancients have ſpoken. Theſe three Particulars, are the extraordinary Poſtures which all Authors do attribute unto it, and which have made it to be called *Scops*, from σκώπτειν, which according to *Athenæus*, ſometimes ſignifies to make Sport, in imitating the Geſtures of any one: And the ſame Author ſays, that *Scops* was a kind of Danſe ſo called, by reaſon of the Bird *Scops*, which was as it were, the Inventor thereof. The ſecond Particularity, by which *Ariſtotle* and *Pliny* have deſigned this Bird, conſiſts in ſome feathered Eminencies, which they do put on both ſides of the Head, in the manner of great Ears. The third is the colour of its Plumage, which *Alexander Myndienus* in *Athenæus*, declares to be Blewiſh, and of a Lead-colour: to which it muſt alſo be added, that they do ſay, that this Bird is of *Africk*.

There is none of thoſe that have ſeen the *Demoiſelles* of *Numidia*, in the Park of *Verſailles*, who have not obſerved their Gate, Geſtures, and Leaps, to have a great deal of Relation to the *Bohemian* Manner, whoſe *Danſe* they ſeem to imitate. And it might be ſaid, that they are mainly pleaſed to ſhew their Graceful and handſom Diſpoſition for leaping, and that they do follow People, not to have what is thrown to them to eat, as commonly do Savage Animals when they are tamed, but to be taken Notice of; never failing, when they ſee that they are lookt upon, to fall a Danſing and Singing.

All that we diſſected had the feathered Ears, which have given the Name to the *Otus* of the Ancients. Theſe were Appendices three Inches and a half long, compoſed of white Feathers, made of fine long Fibres, after the manner of the Feathers that young *Herons* have on the Back near the Wings. All the reſt of the Plumage was of a leaden Gray, ſuch as it is deſcribed by *Alexander Myndienus* in the *Otus*; except only ſome great Feathers of the Wings which were of a darker gray, at that part of the Feather which appears, and ſome Feathers of the Head and Neck: But for all this, the Plumage in general may paſs for a lead Colour.

In ſome of our Subjects, the *Head* had on its Crown ſome Plumes erected like a Creſt, an Inch and a half long. Theſe Feathers were of this leaden Gray, which was prevalent over all the Body. In all of them, the ſides and hinder-part of the Head were garniſhed with black and ſhorter Feathers than the reſt. From the *Canthus* or Corner of each *Eye*, there went a ſtreak of white Feathers, that paſſed under the Appendex, which formed the great feathered Ears. The fore-part of the Neck was adorned with black Feathers, compoſed of long Fibres, much finer and ſofter than thoſe of the *Criel Heron*; they hung down upon the Stomach, about Nine Inches long, with a very great Grace and *Decorum*.

From the end of the *Beak* to the extremity of the *Leggs* extended there were three Foot and a half. The *Beak* meaſured two Inches in length; it was ſtrait and pointed. The Neck was fourteen Inches. From the Thigh Bone to the extremity of the greateſt Toe, was ten Inches.

The *Eyes* were large, having the Eye-lids black. The internal Eye-lid was white, interſperſed with a great many blood Veſſels.

The *Leggs* were covered on the foreſide with great Scales, which were five Lines long and four broad: on the inſide they were garniſhed with ſmall Scales of an *Hexagonal* Figure. The ſole of the foot was ſpeckled like *Chagrin*. The Talons were black, and moderately crooked. The greateſt Toe, which was that of the middle, had four *Phalanges*; the leaſt which was on the outſide had five; the middling one that was on the inſide, three; that behind but one.

The *Liver* was ſo large in one of our Subjects, that it filled almoſt the whole capacity of the lower Belly. In the reſt the right Lobe was only four inches in length, and the left three. In this Lobe which covered the *Gizzard*, there was a Cavity to receive the Anteriour part thereof, which was ſharp, making as it were an edge. In four of our Subjects the *Liver* was Scirrhous being filled with a great quantity of ſmall yellow grains, like to *Millet*. This Scirrhous Conſtitution did in ſome meaſure intimate to us that theſe Livers were compoſed, as it were, of ſeveral ſmall Lobes, each likewiſe compoſed by the conglomerating of ſeveral Glands. It was alſo ſeen after what manner the *Rami Capillares* of the *Vena Porta*, *Cava* and *Ductus Bilarii*, went into each of the Lobes; and it might be judged that there were ſome which were diſtributed to each of the Glands, becauſe that having blown into theſe *Ductus*'s, it was obſerved that in the Livers, which were not yet quite hardned, the little Lobes, and even the minute Glands, whereof the ſmall Lobes are compoſed, were ſometimes raiſed together, and ſometimes apart. In fine, as the ſound Livers ſeemed to have a Subſtance homogeneous and continued, by reaſon of the ſoftneſs which is equal in all the parts that conſtitute their *Parenchyma*; they do alſo appear compoſed of ſeveral diſtinct and ſeperate parts, which we call Lobes, compoſed likewiſe of Glands, in thoſe that have been hardned by Diſtemper, by reaſon that this Induration not equally prevailing over all the parts, ſhews their diſtinction: the *Interſtices* of the Lobes and Glands being ſofter, by reaſon of ſome remainder of Blood in theſe *Interſtices*, of which the Glands were deſtitute. It muſt be nevertheleſs granted that the Experiment, by which different parts were ſeen ſeparately to riſe upon blowing into the Veſſels which are diſtributed to the different Lobes of the Liver, affords a Conjecture more certain, to conclude that the ſubſtance of theſe *Viſcera* is Glandulous, and that it is not from the different Conſiſtence which the Scirrhous diſpoſition cauſes in the Liver; and tho it frequently happens that the *Spleen*, when it is Scirrhous, diſcovers ſome hardned Graines, like thoſe which are in the Scirrhous Liver, yet it is certain that the Spleen is not Glandulous like the Liver: for this may cauſe a belief that this Argument is equivocal, and that theſe Graines may be produced as well by ſome obſtructions which do ſtop the paſſages, ſuch as are thoſe of the Spleen, as by the Induration of the Glands, ſuch as are thoſe whereof the Liver is compoſed.

We found no *Gall-Bladder* in two of our Subjects; in the other it was ſmall, of an oval Figure, not exceeding five lines in length and four in breadth.

It was faſtened to the right Lobe by its Neck, the reſt being looſe and pendent. The *Ductus Cyſticus* proceeded near the Neck, and was joyned to the *Jejunum* being a line in thickneſs, and four inches four lines in length: the *Hepaticus* came out of the Liver lower than the Gall-Bladder, and was but two inches long: it was inſerted near the *Cyſticus*.

The *Spleen* was of a Subſtance very like to that of the Liver, ſeeming to be compoſed of Lobes and Glands, and being Scirrhous. Its Figure reſembled that of the Kidneys of Terreſtrial Animals, the *Splenatick Veſſels* entring through its gibbous part, after the ſame manner as the *Emulgents* do enter into the Kidneys. It was ſeated above the left Kidney, and between the two Lobes of the Liver, ſo that it appeared to be a third Lobe. It was united to the ſecond *Ventricle* by the means of a Membrane that held the Splenatick Branches.

At the bottom of the *Oeſophagus*, where it began to dilate, there were two Glands, three lines long, of an oval Figure, red, and with a Cavity in their middle: They were faſtned to ſome branches of the Nerves of the ſixth pair. The *Oeſophagus* was dilated towards the bottom, to make a *Craw* about fifteen lines Diameter, and ſix inches long. Its lower part, which was two inches long, was of a ſubſtance different from the ſuperiour, its external Membrane being thicker and more fleſhie, and having between this and the internal Membrane ſeveral little Glands regularly ranged one by the other, as they are ſeen in ſeveral Birds, and as it is deſcribed and Figured in the *Buſtard*.

The *Gizzard* meaſured two inches and a half in length, and two in breadth. It was very like to that of a *Hen*, having a thick and hard Fleſh. It was different therefrom in its interiour Membrane, which was yellow, hard, and almoſt all ſeparated from the fleſhie part. This Membrane being dried did break like Glaſs, as it did in the *Indian Cock*. In one of our Subjects there was found in the Gizzard ſeveral Stones, which ſeemed to be worn by their mutual rubbing.

The *Inteſtines* were ſix foot long, and two lines broad. Their Coats were extraordinary thin. Each *Cæcum* meaſured ſix inches in length. The *Rectum* was dilated towards its extremity, where it had a very ample Cavity, into which the *Ureters* with the *Vaſa Spermatica Deferentia* opened, in the Male: in the Females the *Ureters* with the Paſſage called *Oviductus*, which is their *Matrix*, had likewiſe their Mouth in this place.

There were two *Pancreas*'s of unequal length, the right being five inches and the left four. They were faſtened to the *Meſentery*, which afforded them ſtore of very viſible Veſſels. Their Subſtance was ſoft, and ſo light, that the two together weighed but one Drachme. The *Ductus Pancreatici* proceeded from their upper part. The right *Ductus* was ten lines; the left but eight. Altho they were inſerted in two different places, their mouths were on the inſide very near each other, and adjoyning to the mouth of the *Ductus Bilarii*, they were cloſed again with the ſame *Caruncle* as uſually.

The *Teſticles* meaſured ſix lines in length and four in breadth: they were immediately connected to the Trunck of the *Aorta* and *Cava*, being ſeated towards the upper part of the *Kidneys*. They had an *Epididymis* looſe from the *Teſticle*, which hung by one end. It was five lines long, of a green colour, the *Teſticle* being of a whitiſh-yellow. The *Ductus Deferens* proceeded not from the *Epididymis*, but from the lower part of the *Teſticle*, from whence deſcending along the *Vena Emulgens*, it was faſtned to the *Ureter*, ſo that the *Ureter* and *Deferens* made but one *Ductus*.

The Females had *Teſticles* like thoſe of the Males, except the *Epididymis* which was wanting. Immediately underneath the *Teſticles* the *Ovarium* was placed. 'Twas a heap of a great number of little Eggs different in ſize, ſome being as big as little Peaſe, others as ſmall as Rape-ſeed. The paſſage called *Oviductus*, that ſeems to have relation to the Part called *Tuba* in the *Matrix* of Terreſtrial Animals, was enlarged at the top like a Funnel which embraced part of the Eggs. This Funnel which repreſents the Fringe of the *Tuba* of Terreſtrial Animals, was made of a very fine Membrane; the reſt of the Paſſage, whoſe Membrane was a little thicker, deſcended along the left Kidney, to which it was faſtned by the means of a Membranous Ligament, an inch broad, in form of a *Meſentery*, which grew along the *Vena Emulgens*, from which it received ſeveral branches, which connected with the branches of the *Emulgent Arteries*, were diſperſed in the Membranes whereof this Ligament was compoſed, and did likewiſe paſs into the Tunicles of the Paſſage called *Oviductus*. This Paſſage, which was very ſtreight in its upper part, was greatly enlarged towards the bottom, where it opened into the extremity of the *Rectum*, with a very ſtreight Mouth.

The *Kidneys* were three inches long and ſeven or eight Lines broad, being indented in ſeveral places after the uſual manner of Birds. The *Vaſa Emulgentia*, *viz.* the Vein and Artery, were of a Structure very different. The trunck of the *Aorta* deſcending directly, without dividing into two other truncks, did plainly ſhoot forth on the right and left ſome branches of a mean ſize. The firſt, third, and fourth, which were the leaſt, did enter into the *Kidney*, and made the *Emulgents*. The ſecond, and fifth, which were bigger, were the *Crural Arteries*. The ſixth and ſeventh were loſt in the lower part of the Belly. The trunck of the *Vena Cava* having paſſed a little underneath the beginning of the *Kidneys*, was divided into two great Branches, each of which was again ſubdivided into two others: the one of theſe branches run along the Kidney, and was there faſtened by ſeveral very ſhort branches, which were the Emulgents. The other Branch was likewiſe divided into two others, one of which did alſo make the *Vena Cruralis*: the other paſſing underneath the Kidney, joyned it ſelf to the oppoſite branch; and both made but one branch laid upon the Artery, which was divided like the Vein, and was diſtributed as the other into the lower parts of the Belly.

The *Ureter* proceeding from the upper part of the Kidney, went under the branch of the *Vena Cava*; and running along the Kidney, joyned it ſelf with the *Deferens*, to make together but one ſingle Veſſel, as has been declared.

The *Larynx* was compoſed of a *Cricoides*, and *Arytænoides* as in the *Gooſe*.

The Rings of the *Aſpera Arteria* were intire, of a very hard ſubſtance, near that of a Bone. Their Figure was particular, each being notched and indented in two places, and joyned together by this Notch, *viz.* at the places which did anſwer to the two ſides of the Neck: the reſt, which was not notched, being foreward and backward, ſo that the notches of one Ring entring into the notches of the other, it happened that the reſt of the Rings which were not notched, did on the fore-part cover the halves of two Rings, and was covered behind with thoſe very Rings which it covers in the fore-part. This Structure made theſe Rings to enter into each other, which they could not do very far, being hindred by theſe Notches, which made one Ring to ride over the other, and made the Artery that it could not bend ſo eaſily towards the ſides, as forwards and backwards, where there was nothing that might hinder the Rings from entring into each other.

The Figure of the whole *Artery* was not leſs ſtrange than its Compoſition: for after having deſcended along the Neck in a ſtrait line about the length of a foot, it turned outwards; and inſtead of entring into the *Thorax*, it did enter into a hollow Cavity in the Bone of the *Sternum*, where being deſcended about three inches, it was re-bent towards the place through which it had entred, and from thence deſcended into the *Thorax*, where it was divided into its two Branches. The Rings in this whole Circumvolution were ſo ſtrongly faſtened to each other, that they were not capable of any Motion: neither have they any need thereof, being thus incloſed within the *Sternum*. The Rings of the part which was in the Neck were looſer, to yield to the motion of the Neck.

At the bottom of the *Aſpera Arteria*, there was a bony knot, having the form of a *Larynx*, which on the inſide was divided in two by a ſmall Tongue, as in the *Gooſe* and ſeveral other Birds. The Branches which went to the Lungs were likewiſe, according to the uſual manner, compoſed of Cartilaginous Demi-Circles at the top, being garniſhed underneath only with a very thin Membrane. The round and long Muſcles which in ſeveral Birds do faſten the *Aſpera Arteria* with the *Sternum*, did take their Riſe from that part of the *Sternum* which is Articulated with the *Clavicula* or forked bone, and were inſerted into the ſides of the *Aſpera Arteria* a great deal higher than the place of their Origine, ſo that their Action was to draw the *Aſpera Arteria* downwards. They were a line and a half in Diameter, and near two Inches in length.

When the *Aſpera Arteria* was blown into, the Bladders of the *Lungs* which deſcended to the bottom of the Belly, did ſwell and raiſed up the *Liver*. At the ſame time that the Bladders were ſwelled, the *Oeſophagus* and *Craw* were likewiſe obſerved to ſwell as in *Pigeons*; and when the *Oeſophagus* was breathed into, the Bladders did alſo riſe; but the Air did more eaſily paſs from the *Aſpera Arteria* into the *Oeſophagus*, than from the *Oeſophagus* into the *Aſpera Arteria*. The uſe of this Communication, and the ways by which it is performed, are not as yet well known: we refer the ſpeaking thereof to the Deſcription of the Pigeon.

The *Heart* was two inches long and an inch broad at its *baſis*: it weighed half an ounce. The *Pericardium* was faſtened to the Heart by ſeveral ſmall Fibres. The right *Ventricle* was, as uſually, larger than it is long. Its Interiour was extraordinary Smooth. The fleſhy Valve which Birds have at the mouth of the *Vena Cava*, was five lines long, and half a line thick. The Arteries of the Heart had their *Valvulæ Sigmoides*, as uſually. The Fleſhy Ligament which faſtned one of the Partitions of the right Ventricle to the other, was longer and thinner than generally it is.

The *Aorta*, coming out of the Heart, was divided into three Truncks. The leaſt was the *Aorta deſcendens*, which made the Croſſe, by turning towards the right ſide as in the Generality of Birds. The two other greater Truncks were the *Axillares*, which hauing caſt forth two ſmall Branches, which were the *Carotides*, were divided into ſeveral other great Branches, which were almoſt all employed and diſtributed into the Muſcles of the Wings. The *Carotides* a little above their Origine, had each a Gland, which was faſtned to them. Theſe Glands were two lines long, and a line thick.

In the lower Beak on both ſides of the Tongue, under the inward Tunicle of the Mouth, there was found two Glandulous Bodies, from whence proceeded ſeveral *Lympheducts* which opened into the Mouth, and there diſcharged, being ſqueezed,a white and Viſcous humour. There were two of them towards the upper part a great deal bigger than the others. The *Tongue* was fleſhie at top, and Cartilaginous underneath as in *Hens*.

The *Tunicle* of the *Palate* was rough, with a great number of little Nipples, and of hard and Membranous points. It likewiſe included a glandulous Body, which ſhot forth two great *Ductus*'s opening into the Mouth. There was diſcovered a great quantity of other little glands at the ſides of the *Larynx*, which had alſo ſome *Lympheducts*.

The *Cranium* or Skull was above half a Line thick. The *Brain* was divided in two, as generally in Birds. Each part was eleven lines long, and ſeven broad. The *Cerebellum* was eight lines every way. Both together weighed but a Drachme and a half.

The internal *Eye-lid* was large, and was eaſily extended over the whole Globe of the *Eye*.

The *Punctum Lachrymale* was double, round, and very large. It opened as is uſual into the cleft of the hinder part of the *Palate*. The lower *Glandula Lachrymalis* was coucht under the Globe of the *Eye* in the great *Canthus*. It was ten lines long and two broad. Its *Ductus* was great, and opened between the *Eye* and internal *Eye-Lid*. Having Syringed into this *Ductus*, the Gland ſwelled very much. The upper *Glandula Lachrymalis* was very ſmall not exceeding three Lines in length and two in breadth.

The *Sclerotica* was Cartilaginous before, having as it were a harder Ring than the reſt, three lines broad. The *Cornea* had a border or yellow Circle quite round, joyning the *Conjunctiva*. The *Iris* was of a dark red: the *Tapetum* of the ſame colour; the reſt of the *Choroides* was extraordinary black, We found not that other black Membrane like a Sack, which proceeds from the *Optick Nerve*, and which we have always found in the Birds that we have diſſected, without being able to conjecture what its uſe may be. All that we could ſurmiſe is, that this part has an Office like to that of the *Choroides*, in that the one and the other do, amongſt other things, ſerve to prepare the Nouriſhment of the Humours of the *Eye*; which, by reaſon of the tranſparent purity that is requiſite for them, muſt have an Aliment very pure, and wholly exempt from the groſs and Earthy parts, by which Bodies are rendred Opake: for theſe parts, which may be called the Lees of the Blood, are ſeparated therefrom, and retained in the *Choroides* and Purſe of the *Optick Nerve*, which are ſullied and blackned therewith; this being done almoſt after the ſame manner as the *Choroides*, *Placenta*, and Membrane of the *Vterus* are ſullied, if I may ſo ſay, from the groſſeſt and moſt impure portion of the Blood which they retain, to the end that the part deſigned for the Formation and Nouriſhment of the *Fœtus* may be finer and purer. This Conjecture which for theſe reaſons may have ſome probability, has been likewiſe confirmed by the particularity that we have remarked in our Subject; where this black Purſe not appearing, we found the *Choroides* a great deal thicker than ordinary; as if the whole dregs of the blood, which in the Eyes of other Birds ſhould be retained in the *Choroides* and black Purſe, had here been collected into the *Choroides* alone.

THE

The Explication of the Figure of the OSTRICH.

IN the lower Figure it may be ſeen that the Feathers of the Wings and Tail could not be proper for Flying, the parts which do compoſe theſe Feathers not being hook'd together as they are in other Birds; that the Eye, which is not obliquely Scituated after the uſual manner, has great Eye-lids, The opening of which is long-wiſe as in Man; that the Neck, Head, and Thighs are deſtitute and unprovided of Feathers, and that each Foot has but two Toes.

In the Upper Figure.

A A. *Repreſents the Cavity of the middle of the* Thorax.

B B D D. *The Cavity of the lower Belly. Theſe two Cavities are formed by two great* Diaphragms, *and ſeparated one from the other by the tranſverſe* Diaphragme *which is between* A *and* B, *and which is garniſhed with Fat underneath.*

E E E E. *The four* Bladders *of the right ſide of the* Stomach.

C C C C. *The four* Bladders *of the left ſide. Theſe four Bladders are incloſed on each ſide between the great* Diaphragme *and* Muſcle *of the* Lungs.

G G. *The* Lungs, *each of which is ſhut up between the Muſcle of the Lungs, and the Ribbs.*

H. *A part of the* Cartilago Cricoides,

I I. *The* Cartilago Tyroides.

K. *The* Tongue.

L L L. *The hinder part of the* Sclerotica, *which makes half the Globe of the* Eye, *the fore-part being taken away.*

M. *The Membrane folded like a Purſe, which proceeds from the* Infundibulum *or* Funnel N, *formed by the extremity of the* Optick Nerve, *and uniting near the* Ligamentum Ciliare.

O. *The* Optick Nerve.

P. *The* Cryſtallinus *with the* Ligamentum Ciliare.

Q Q. *The* Cerebrum *uncovered.*

R R. *The* Dura mater *raiſed up and thrown backward, upon the* Cerebellum.

S. *The* Glandula Pinealis *in its place.*

T T. *The upper part of the* Cerebellum.

V V. *The* Sinus Longitudinalis.

X X. *Two* Tuberoſities *or Swellings, making the lateral and inferiour parts of the* Cerebellum.

Y Y. *Two Cavities or* Ventricles *which are in the Swellings of the* Cerebellum.

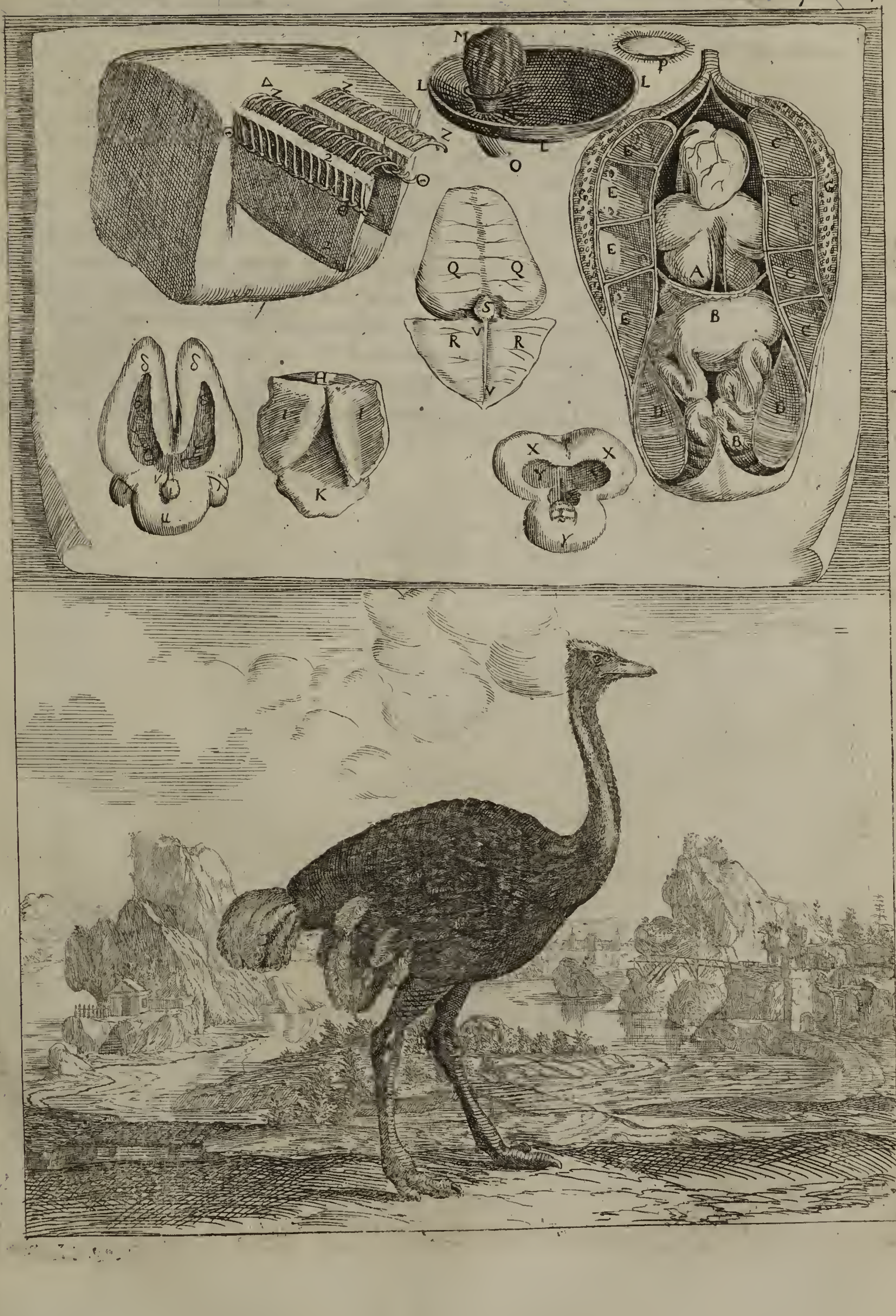
α. *The Cavity which is at the riſe of the* Medulla Spinalis *made like a* Pen.

β. *The* Vermiforme Apophyſis *of the* Cerebellum,

γ. *The* Cerebellum *raiſed, and turned backwards-*

δ δ, *The* Brain *divided in two, after having cut the ſmall Fibres which joyn the two parts.*

pa. 214.



ε ζ. *The upper* Ventricles *in which is ſeen the* Lacis Choroides *marked* ζ.

ι. *The* Glandula Pinealis *bent a little backward out of its place.*

λ λ. *Two Swellings Scituated under the Brain. They are the ſame which are marked* X X.

μ. *The* Cerebellum.

ν. *The fourth* Sinus.

Δ. *A piece of the Stem of a Feather viewed with the* Microſcope.

1 1. 2 2. *Two of the* Filaments *whereof the leſs Beard of the Feather was compoſed. Here is repreſented only the beginning, the reſt being cut off: they are garniſhed on each ſide with a row of Fibres.*

Z Z. *The Fibres which are at the ſide, toward the end of the whole Feather; theſe Fibres having ſeveral ſmall Crotchets or hooks bent downward, which are like a Latch, according to the compariſon that is made thereof in the Deſcription.*

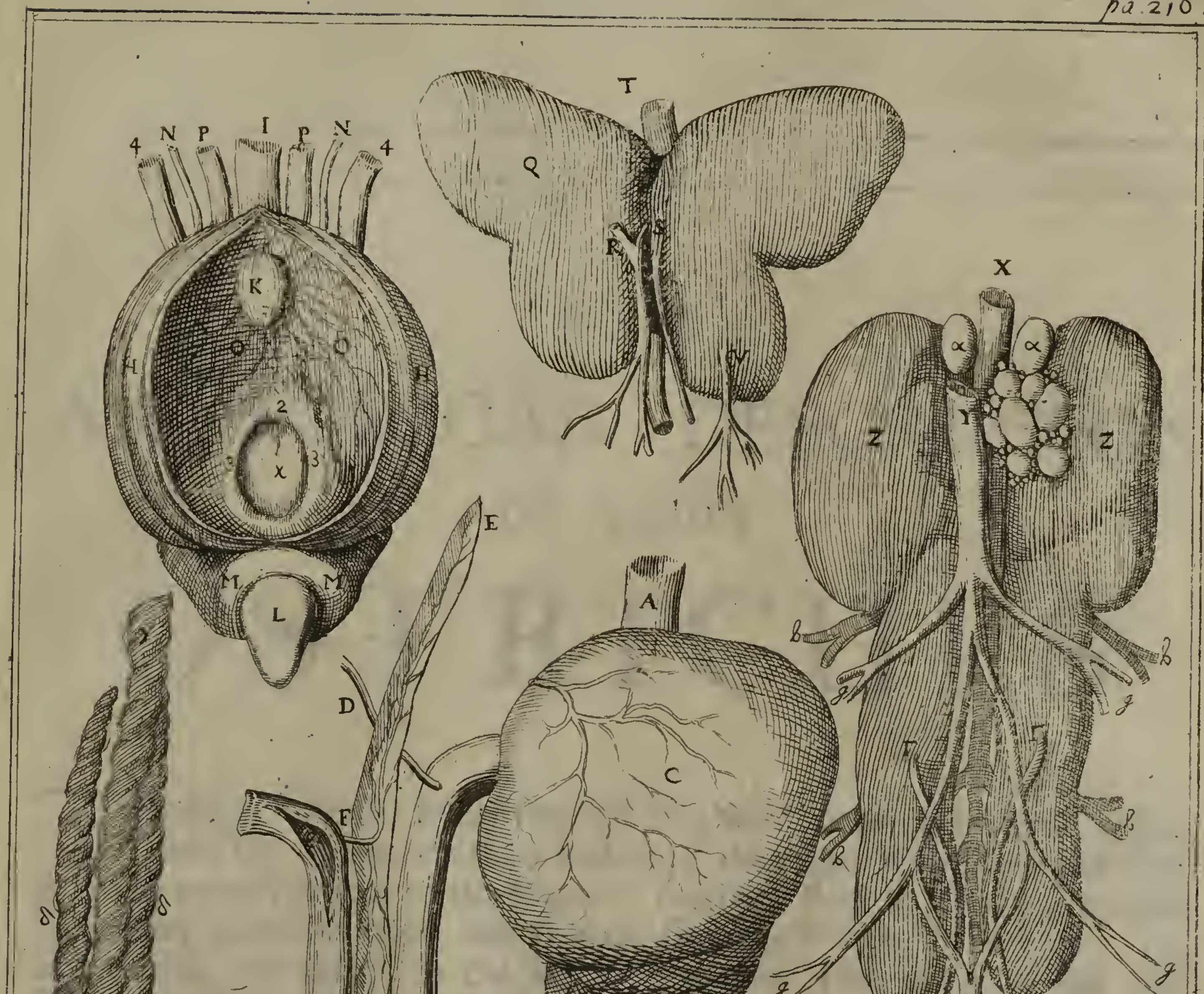
Θ Θ. *The Fibres which are at the ſides towards the hollow of the Feather; theſe Fibres have ſeveral little Hooks bent upwards, reſembling the Catch to which the Latch is faſtned, when it is puſhed forward enough to fall into the Catch.*

The

The Explication of the Second Plate of the *OSTRICH.*

A. *Is the* Oeſophagus.
B. *The Bottom of the* Craw, *which deſcends underneath the* Gizzard.
C. *The* Gizzard.
D. *The* Ductus Hepaticus.
E E. *The* Pancreas.
F. *The* Ductus Pancreaticus, *whoſe Aperture into the* Inteſtine *is marked* e.
G. *A part of the* Colon *at large, which is garniſhed on the inſide with Fillets marked* i i i.
H H. *The great* Pouch *which is at the bottom of the* Rectum.
I. *The* Rectum.
K. *The Extremity of the* Rectum, *which forms a Swelling in the great* Pouch.
k L. *The* Penis. *Its Origen is marked* k: *it is folded towards* 2. *underneath, and ſuffers the part* L *to go through the Aperture of the little Pouch marked* M M.
N N. *The* Ureters.
O O. *The Opening of the* Ureters *into the great* Pouch.
P P. *The two Muſcles of the* Anus *and* Penis.
4 4. *The two ſecond Muſcles of the* Anus *and* Penis.
3 2 3. *The border of the hole of the great* Pouch.
Q. *The* Liver.
R. *The great* Vena porta.
S. *The Origine of the* Ductus Hepaticus.
T. *The upper* Vena Cava.
V. *The little* Vena Porta.
X. *The* Aorta deſcendens.
Y. *The lower* Vena Cava.
Z Γ, Z Γ. *The* Kidneys.
Γ Γ. *The* Ureters.
α α. *The* Teſticles.
β β. *The* Crural Arteries.
g g. *The* Crural Veins.
γ γ. *A part of the* Colon *in little, joyned to the double* Cœcum *formed like a Screw, marked.* δ δ.
ε ε. *The Paſſage or* Matrix *called* Oviductus, *in Birds.*
ζ. *The internal Orifice of the* Matrix.
θ. *The Extremity of the* Oviductus, *which makes the* Infundibulum *or* Tunnel.
ψ ψ. *The broad Ligament of the* Matrix.
λ. *The* Teſticle *of the* Male.
μ. *The* Vaſa Spermatica Præparantia.
ν. *The* Epididymis.
ξ. *The* Deferens.

pa.216.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THE
ANATOMICAL DESCRIPTION
OF EIGHT
OSTRICHES.

THe Eight *Oſtriches* which we deſcribe, were almoſt of one ſize. There were five Males, and three Females; they were ſeven Foot and a half from the top of the head to the ground; from the Back to the Crown of the Head they were three foot, and as many from the Belly to the ground. The Body, from the Breaſt to the beginning of the Tail, exceeded not three Foot; the Tail was a Foot long; the Wing, without the Feathers, but a Foot and a half, being extended, and with the Feathers, three Foot.

The Plumage was alſo in ſome meaſure alike; for moſt of it had black and white, and ſome Gray Feathers. *Scaliger* do's upon good Grounds laugh at *Cardan,* who was of Opinion, that *Oſtriches* had red, blew, and green Feathers, not knowing that they are dyed of theſe Colours. The greateſt Plumes proceeded from the extremities of the Wings and Tail. The great ones were moſt commonly white; and the next row was compoſed only of black. There were ſome of them ſmaller, being white, others black, which garniſhed the Back and Belly. The Flancks had no Feathers, no more than the Thighs, and under part of the Wings. The bottom of the Neck was half way adorned with Feathers, much ſmaller than thoſe of the Belly and Back; ſome of which were black, and others white. They were gray in one of the Males, and in one of the Females.

All theſe Feathers were of one ſort. This is peculiar to the *Oſtrich*; for it has not Feathers of ſeveral ſorts, like other Birds, which have ſome ſoft, and as it were lanuginous, to ſerve them for Furr; others hard and firm, for flying; ſome lanuginous only at their beginning, and firmer toward their extremity, which is made like a Scale, to the end that being all ranged one upon the other, and covering ſome with their extremity, which is firmer, the Down which is at the root of the others, they might compoſe as it were a Veſtment, to defend the Birds from the Inconveniencies of the Wind

and

and Water. Now this is not in the Feathers of *Oſtriches*, which are all ſoft and fibrous like Down, ſo that they do ſerve them neither for flying, nor for covering them commodiouſly enough to defend them from external Injuries. We likewiſe obſerved another equality in the Feathers of the Wings of the *Oſtrich*, which is peculiar to them: for the great Feathers of the Wings of other Birds, have one ſide broader than the other; but thoſe of the *Oſtrich* have the Stem exactly in the middle of the Feather. There is reaſon to think, that this equality is the ground of the Hieroglyphick of the *Ægyptians*, who do repreſent Juſtice by an *Oſtrich*'s Feather.

In the enumeration of the Wonders of Nature which are read in the *Book* of *Job*, thoſe of the Structure of the Wings of Birds is one of the moſt Conſiderable. This wonder is expreſſed by the reflection which God cauſes *Job* to make on the difference that there is between the Feathers of the *Oſtrich*, and thoſe of *Herons* and *Faulcons*; that is to ſay, of Birds that have Feathers for flying, and of thoſe which have them not for that uſe; for there is nothing indeed more admirable, than this Structure of Feathers deſigned for flight, which conſiſts principally in three things, *viz.* in the texture of the Threads and Fibres, of which the Beards of the feathers are compoſed; in the Figure of the whole feather, and in the particular motion of each feather.

To know and examine theſe particularities, it muſt be obſerved; that almoſt all ſorts of feathers are compoſed of two parts, *viz.* of the Tube or Quill from whence the Stem proceeds, always leſſening it ſelf to the end of the feather; and of the Beards, which are faſtned on each ſide to the Stem of the Quill, and which do make the breadth of the Feather: that the Threads whereof theſe Beards are compoſed, are flat, and plac'd with their flat ſides towards each other, to the end that they might eaſily bend for the approaching each other, and that being harder to bend the other way, they do add more ſtrength to the whole feather: that this ſtrength and firmneſs is likewiſe fortified by the manner with which the threads whereof theſe Beards are compoſed, are interlaced with one another, this Texture or interlaceing being made by the means of an infinite Number of Fibres, which the threads do ſhoot forth on each ſide, to hook and grapple with each other: that theſe Fibres are crooked after a different manner; for thoſe which proceed from the Thread, on the ſide towards the extremity of the feather, are longer, more flexible, and bent down wards; and thoſe which do proceed from the ſide towards the beginning of the feather or Quilly end, are ſhorter, firmer, and turned upwards. For it muſt be conceived that all theſe Fibres having Springs, thoſe which are longeſt, moſt flexible, and bent downwards, do turn upwards at the meeting of the other Fibres, when two threads are forc'd one againſt the other; and that afterwards when theſe long Fibres are forced far enough over the others, their crooked parts falls into the Cavity made by the crooked parts of thoſe other Fibres, even as the Latch that is faſtned to a door, falls when the Door is thruſt-to and enters into the Cavity of the Catch faſtned to the Door-poſt, and there hooking it ſelf, faſtens the Door: for it is properly after this manner that one thread of a feather is faſtned to the other.

This admirable Structure of the feathers, which it is eaſie to ſee with the Microſcope, ſucceeds ſo well for the uſes to which Nature has deſigned it, that when one thread has been ſeparated from the other by ſome external Violence, it is capable of being reclaſped with an incredible facility. It may be ſaid that this is not unknown to the Birds; who frequently buſie themſelves in putting in order with their Beak the Threads of theſe Beards, when they have been diſordered; for this is ſufficient preſently to recover and reduce into their former order thoſe feathers which are ſo eaſily ruffled, and as it were broke; and this diſpoſition is much more advantagious to them than if they were hard to ruffle or break, but being once torne or broken, were no more capable of revniting. And it may be ſaid that this Structure has not been known by thoſe who have thought that Birds do carry a kind of glue in their Beak, by the means of which they do again rejoyn their feathers when they are torne: for the Wings of Birds are neither mended with ſize nor glue; or at leaſt they would be ſpoil'd, otherwiſe then they are, by the Rain and Waters, in which they are frequently Plunged, if their Fibres were joyned otherwiſe than by this admirable Texture, of which experience may eaſily be made, by ſeparating the Threads of the Beards of the feathers, which are ſeen to rehook of themſelves, and without glue, by reapproaching them only.

It muſt be obſerved in theſe ſecond place that theſe threads are not perfectly ſtrait, but a little bent, to make the whole feather hollow underneath; which ſerves for two things, *viz.* to make the Beards ſtronger and leſs capable of being bent upwards, when the feather ſuddainly ſtrikes the Air; and to make the Air catch in this Cavity, more to reſiſt the wing which beats it in its deſcent, and cauſe it alſo leſs to reſiſt the ſame wing when it is raiſed, by reaſon of the convexitie of the feather over which the Air glides more eaſily than it would if it was flat: for it muſt be conſidered that for flight two things are neceſſary; the firſt that the Air greatly reſiſts the Beating of the wing, to the end that the Bird may bear it ſelf thereon; the ſecond, that the ſame Air reſiſt as little as is poſible the raiſing up of the wing again; as well to the end that the Bird may not ſink asmuch in raiſing the wing, as it riſes in beating it down, as to leſſen its force where the wing riſes, leaſt the Bird weary it ſelf to no purpoſe.

In the third place it muſt be obſerved that for theſe very reaſons, *viz.* of making the Air reſiſt the wing ſtriking it, and yield to it when it is raiſed, Nature makes uſe of two things: the firſt is that when the wing is raiſed, it becomes leſs than when it is beat downwards; which is done ſometimes by cloſeing the feathers, and makeing them to ſlipp one under the other; ſo that the half of one covering the half of the other, each feather can ſtrike the Air only with its half: Some times by making them to go from underneath the others, ſo that each ſtrikes the Air with its whole breadth. The Birds which have the wings long and pointed, do make uſe of this means. The other way is for Birds that have ſhorter wings: for they do make uſe of an Artifice which Rowers do imitate in the management of their Oars, which is to make the Water to be ſtruck with the flat of the Oar, when they do make it to go downwards, and that it be cut by the edge of the ſame Oar when they do raiſe it upwards: for the ſame thing happens to the feathers of the extremity of the wing, which do ſtrike the Air with their flat, when the wing is lowered, and do cut it when it is raiſed; which is done by a

Motion like to that of the Oars which Watermen do make to turn a little, when they do raiſe them upwards: For each of the great feathers has this Motion apart, by which it is a little obliquely turned, when the wing is raiſed, and this feather is reduced into its former Situation when the wing is lowered. This Action is very diſtinctly obſerved when Birds do for ſome time hold their wings erected, by an extenſion like to that which is done in reaching; this State affording more leiſure to ſee that winding of the feathers, than when they do ſtrike their wings in flight: for than the wings being thus raiſed, it is obſerved that the great feathers, which are the Principal Organs of flight, are all ſeparated from each other, by reaſon of their obliquitie, which ſeems to open, for the paſſage of the Air, as many Doors as there are feathers; which are cloſed when the wing coming to lower it ſelfe, all theſe feathers do retake their former Situation, and do beat one upon the other to make of the whole wing one continued ſurface, capable of overſpreading a great quantity of Air.

In the fourth place, it muſt be obſerved that this oblique Motion of every feather belongs not to thoſe of the Taill, which has different uſes from thoſe of the wings. There are two Principal ones; the firſt is to ſerve as a Rudder, and to keep in the whole Bird a ſtrait Motion, when it is kept ſtrait and of turning the body downwards, when it is kept lowered, or upward when it is raiſed. The other uſe is to ſerve to help it forward, when it is ſuddainly moved by theſe two ſucceſſive Motions, which do produce the ſame effect as the Tail of Fiſhes.

Now this whole Mechaniſme is wanting in the feathers and Wings of the *Oſtrich*: For the threads of the Beards which are at the two ſides of the ſtem of the Quill of the great feathers are never faſtned one to the other, but floating and flexible, not being crooked, but ſtrait and even without having any of the Diſpoſitions neceſſary for the facilitating the interlacing which they have with each other in the feathers of other Birds. Therefore *Ariſtotle* ſay's that the feathers of *Oſtriches* are like the Haire of Terreſtial Animals, that is to ſay that they are more proper to cover their Body's than to fly with.

Theſe Feathers have not likewiſe that particular motion which renders them ſome times ſtrait, ſome times oblique, becauſe that this would be uſeleſs to them, the Beards not being joyned together to make the Texture and Continuity which the other feathers have, to ſtrike all the Air that is met with under the Wing; ſo that it may be ſaid that the feathers of the Wings of the *Oſtrich* are more like to the Pendants of Ships than to their Sails; altho' *Ælian* reports that theſe Animals do make uſe thereof as of Sails, when to render their courſe ſwifter and lighter, they do extend theſe feathers to the wind, to the end that it may drive them: For ſails are not only ſervicable in Ships meerly as an Obſticle, which reſiſting the wind by its bigneſs only, receives a ſimple impulſe ſo as the hull of the Veſſell does; but they muſt be conſidered as an obſtacle of a commodious figure and ſhape, which being managed and governed after a certain manner, may draw a greater advantage from the agitation of the Air, for the motion of the Veſſel, than it would do without this figure and Government. Thus the Plumes of the *Oſtrich* cannot be uſefull to it by their figure or Motion, for if they aſſiſt them to advance forward by forcing their wings backwards, they would hinder them as much in bringing them forward, and there would happen to them one inconvenience to which the Wings of *Batts*, *Butter-flyes*, and *Flyes*, would be ſubject, if Nature had not provided againſt it, by giving the Wings of theſe Animals the means of being contracted in ſuch a manner, when they are raiſed, that they do ſtrike a leſs quantity of Air, than when they are lower'd again. For this Contracting is made in *Batts* by the means of Bones that they have in their Wings, and which do make as it were the fingers of their hands, the diſtance between which are garniſhed with ſkins which they do contract and alternately extend as need requirs. The Wings of *Butter-flyes* and *Flyes* do perform the ſame Action by the means of certain Fibers, which have an effect like to that of the fingers of the *Batt*; and the ſpeed and force with which the wings of Flys are removed, and how they are capable of making ſo great a Noiſe as is that, not only of the buzzing of *Hornets*, but even of little Flyes, ſuch as are *Gnatts*, which is heard to a great diſtance, imitating the ſound of a Trumpet, is a thing very Surprizing.

The Motion of the Wings of the *Oſtriches*, can at the moſt ſerve only after the ſame manner as that of the Tail of other Birds, and thoſe of Fiſhes, which is in truth a motion proper to make a Progreſſion; but it is certain that the Feathers of the *Oſtrich* cannot have this effect, being like a tuft of looſe and floating threads; ſeeing that to the end that ſuch a Motion may have ſome effect, it is neceſſary that the Organ have a Surface, ſtrait, even, and firm, ſuch as it is in a Rudder, in an Oar, in the Sail of a Wind-mill, *&c.*

It is probable that the Author of the Book of *Job* had reflected on all theſe things, when he Deſcribes the *Oſtrich*, as an Animal to which God has deny'd the addreſs which he hath given to other Birds, and which he has not furniſhed with Organs convenient to exerciſe the admirable Action of Flying; having ſcarce any other uſe of its Wings, than to raiſe them to receive the Impulſe of the Wind, when it is favourable to its Courſe. Therefore *Cardan* compares, or rather very much oppoſes the *Oſtrich* to the Bird of *Paradiſe*, which was formerly thought to have no Feet; becauſe that the Bird of *Paradiſe* is a Bird, which according to the Opinion of *Cardan*, never walks nor lights on the ground, even as the *Oſtrich* is one which neither Flyes nor riſes into the Air.

Beſides the Feathers which we have deſcribed, we have obſerved that the top of the Neck and Head were garniſhed with a very fine, white, clear Down, ſhining like the Briſtle of a Hog; ſo that it ſeemed to partake more of Hair than of Feathers. This Down was heaped together in little Tufts, compoſed of about twelve Hairs, of but one Line in length, except the Hair in the middle, which was four: All the Hairs of one lock had all together but one Root, which was a little Tube about the bigneſs of the ſmalleſt Pin. This Downe was very clear and very thin in the Neck, and much more on the Head, which was abſolutely bald at the top: This *Pliny* reports to be Natural only to two Birds, *viz.* the *Oſtrich* and *Cormorant*, for that reaſon called *Phalacrocorax*.

At the end of each Wing there was a kind of Spurr, made almoſt like the Pricks of a *Porcupine*: They were an Inch long, and a Line and a half thick at the *Baſis*; their Subſtance was Horny; they were hollow, and in the Cavity there was a Cartilage covered with Membranes and Ligaments, with a great quantity of Veſſels full of Blood. *Aldrovandus* confeſſes that he could never find theſe Pricks in the *Oſtrich*: *Albertus* reports that they do ſerve them for offenſive Arms: *Johnſton* is of opinion that they make uſe thereof as of a Spurr, with which they excite themſelves to ſpeed. There were two on each Wing, the greateſt was at the extremity of the laſt Bone of the Wing, the other was half a Foot lower.

The *Neck* ſeemed more ſlender in proportion than it appears in other Birds, becauſe that it was not decked with Feathers, as was ſaid. The Skin of this Neck was of a livid fleſh Colour; *Gillius* makes it blew. The Head did likewiſe appear very ſmall, for the ſame reaſon of the want of Feathers. *Albertus* finds it abſolutely ſmall. *Scaliger* has reaſon to reprehend *Cardan*, for averring that Birds have commonly the Head little, to the end that its weight may not hinder them from flying; becauſe there are a great many which fly little, as *Hens*, which have the Head much leſs in proportion than other Birds which do eaſily fly: But it is probable that *Cardan* found that his Theoreme was confirmed by the example of the *Oſtrich*, which flyes not, and whoſe Head without Feathers is abſolutely greater in proportion to its Body, than it is in other Birds.

The *Beak* was ſhort and pointed: It meaſured two Inches and a half broad at its beginning; its Figure like that of the reſt of the Head, did not in any ſort approach the Figure which the Head and Beak of a *Gooſe* generally have, as thoſe have ill thought who have called the *Oſtrich Chenocamelus*, that is to ſay *Gooſe-Cammel*.

The exteriour form of the *Eye* did ſufficiently reſemble that of Man, and was very different from the ordinary form of Birds Eyes, which have the Aperture of the Eye round, and the upper Eye-lidd unmovable, and without hair; and the line which go's from one Corner to the other, always oblique: For our *Oſtriches* had the Aperture of the Eye oval, a great Eye-lidd at the top, which lower'd it ſelfe as that below was raiſed, having great Eye-laſhes, which, as in man was a great deal longer than thoſe of the Inferiour Eye-lidd; in the line which went from one Corner to the other being ſtrait, according to the direction of the Beak, there was a third Eye-lid on the inſide, as in the generality of Brutes: 'Twas a very thin Membrane, which was hid in the great Corner towards the Beak: *Aldrovandus* thinks Birds have this Eye-lid, to ſupply the defect of the upper Eye-lid, which is ſo ſhort that it cannot lower it ſelfe to cover the Eye as it does in Man. But it is probable that this internal Eye-lid has another uſe in Birds, ſeeing that it is found in the *Oſtrich*, whoſe upper Eye-lid is large enough to be able eaſily to lower itſelfe; add moreover that the inferiour Eye-lid ſhuts up in Bird's againſt the ſuperiour, as exactly as the upper is joyned in man with the lower.

The *Tongue* was ſmall, adherent as in *Fiſhes*, compoſed of Cartilages, Ligaments and Membranes intermixt with fleſhy Fibres. It was different in our Subjects: In ſome it was an inch long, very thick at the Aperture of the *Larynx*; in others it was not half an inch long, but it was above an inch towards the baſis, being a little forked at the end. Beyond the ſlitt of the *Palate*, towards the *Pharynx*, there were two great Glands, which furniſhed the Spittle.

The *Thighs* were very fleſhie, and very big, and without Feathers, covered with a white skin ſomewhat reddiſh, rayed by elevated wrinckles, of the Figure of a Net, whoſe Maſhes could receive the end of ones finger. In one of the Males, there were little Feathers here and there upon the Thighs, almoſt after the ſame manner as *Geſner* has deſcribed it in his Figure. Some had neither little Feathers nor Wrinckles. The Legs were covered on the fore-part with great ſquare Scales.

The *Foot* was cleft, and compoſed only of two very large *Toes*, which were covered with Scales like the *Leg*. Theſe *Toes* were unequal: the greateſt, which was on the inſide, meaſured ſeven inches, comprehending the *Claw*, which was nine lines in length, and a little leſs in breadth; in ſome reſembling the Naile of a Mans great-Toe. The other Toe exceeded not four inches, and had no Naile. This little one touched the ground only at the end. The great one being ſeen ſideways had almoſt the ſhape a Mans Foot, with its ſhoe on: it was only a little thinner and longer. *Pliny* reports that the Feet of the *Oſtrich* are like to thoſe of the *Stagg*. *Diodorus Siculus*, who calls the *Oſtriches Stagg-Birds*, relies upon this falſe reſemblance. *Suidas* is likewiſe more miſtaken, when he ſays that the Feet of the *Oſtrich* do reſemble thoſe of an *Aſſe*. Thoſe who have named the *Oſtrich Strutho-camelus*, that is to ſay, *Cock-Camel*, according to *Scaliger*, and according to the *Chaldee* Paraphraſe of the fore-cited place of *Job*, have not erred ſo much: for the length of the Legs of the *Oſtrich* has ſome ſimilitude with thoſe of the *Cock* and *Camel*. Moreover the manner after which the Foot of the *Camel* is cleft, which is different from all other cloven Feet, and its Claw, which is alſo quite of another Nature than that of *Staggs* and *Goats*, are particularities which are common to it with the *Oſtrich*. Our *Oſtriches*, like the *Camel*, had a Calloſity at the bottom of the *Sternum*, on which they do reſt like the *Camel*, when they lie down.

Near the *Anus*, in one of the five Males, there was on each ſide three holes of a line and half diameter, and two lines in depth.

At the top of the *Thorax*, under the skin, there was Fat about the thickneſs of two fingers. There was ſome more eſpecially on the fore-part of the Belly, which was hard like Suet: it was in ſome places two inches and a half thick. This Fat was incloſed between two Membranes as ſtrong as the *Peritonæum*. Theſe Membranes, which thus incloſed this Fat, were the *Aponeuroſes* of the Muſcles of the lower *Venter*, which began to be fleſhie only towards the Flancks, the whole fore-part of the Belly about the breadth of a foot being without fleſh. The *Sternum* deſcended not to the bottom of the Belly, becauſe that the Muſcles which move the Wings, and which are faſtned to the *Sternum*, have no need of being ſo great as in other Birds which flye.

The *Oeſophagus* was ſeated on the Body of the *Vertebræ*, being faſtened to the *Aponeuroſes* of the Muſcles of the *Lungs*; of which more ſhall be ſpoken in the ſequell. Its *Tunicles* were very thick, eſpecially that which is fleſhie. It was inſenſibly inlarged, even to ſix inches in breath near the *Ventricle* or *Gizzard*; ſo that it was difficult to mark the place of the ſuperiour Orifice of the *Ventricle*: it ſeemed that the extremity of the *Oeſophagus* did form a *Craw* which was confounded with a *Gizzard*, and that theſe two parts together did compoſe one ſingle *Ventricle.* This Conformation, (which, in general, is very different from that which is common to Birds, where the *Craw* is us'd to have a Contraction which ſeparates it from the *Gizzard,*) was likewiſe more ſtrang, by reaſon of the Situation that it had: for it was not only in the Stomach, but it was lower than the Gizzard, underneath which it deſcended, and towards which it afterwards re-aſcended, ſo that the entrance of the Gizzard was through its bottom; and thus the Orifice, which is commonly called the ſuperiour, was indeed the inferiour.

In ſome of our Subjects, the *Gizzard* was ſeparated on the inſide into two Cavities by an Eminence formed by its Muſculous Fleſh, which, towards the middle, was above two inches thicker than any where elſe. This Eminence contracted the internal capacity directly over the middle, and ſeparated it on the left ſide, where was the inferiour Orifice, called *Pylorus.* The Figure of theſe two Cavities did not outwardly appear, the fleſh of the *Gizzard* being equal; and the whole together had the Figure of the *Ventricle* of Man, making an oval, which was fifteen inches in length and eight in breadth. *Ælian* ſeems to give ſeveral *Ventricles* to the *Oſtrich,* as to Animals which chew the Cud, when he ſays that this Bird digeſts Stones in the *Ventricle* called *Echinos,* which is the ſecond *Ventricle* of ruminating Animals, which is ſo called, by reaſon that its interiour Membrane is filled with wrinckles armed with points like the *Hedg-hog,* which the *Greeks* do call *Echinos:* but this ſort of *Ventricle* was not found in our Subjects. It may only be ſaid that the *Ventricle* of ſome of the *Oſtriches* that we diſſected is double, and not that they have two *Ventricles*; ſeeing that both the parts of the double *Ventricle* are covered with the ſame Membrane, and that this Membrane is different in the different *Ventricles* of Animals which chew the Cud. For the Membranes of the *Craw* were garniſhed with Glands regularly ranged, and framed like the ends of ſmall Pipes, being round, and pierced through the middle at the part towards the inſide of the *Craw,* and unequal on the other ſide, being compoſed of ſeveral *Graines,* after the manner of conglomerated *Glands.* And in this they differed from the *Glands* which are found in the *Craws* of the *Demoiſelles* of *Numidia, Geeſe, Ducks* and ſeveral other Fowl, where theſe *Glands* are ſeen pierced only as in the *Oſtrich,* but they are ſingle, and of the kind of thoſe called Conglobated.

The Membrane that coated the inſide of the *Gizzard,* and which was eaſily ſeparable therefrom, was a line and half in thickneſs in ſome of our Subjects: It was compoſed of two parts, *viz.* of a *Tunicle* which was immediately faſtened to the Fleſh of the *Gizzard,* and of a heap of little Glandulous Bodies, which made a kind of Velvet. Theſe ſmall Bodies, in moſt of the Subjects, were ſo minute, that they appeared to be rather Fibres than Glands: in ſome they were about the bigneſs of a great Pin, and above the length of a Line. They were joyned and glued to each other, as the Fibres are in Wood. There was a great many places where theſe ſmall Bodies were ſeparated, and made ſeveral clefts or chincks. The *Ventricle* of the *Cormorant* was almoſt of this Structure.

Theſe *Ventricles* were always found full of Hay, Graſs, Barley, Beans, Bones, and Stones, of which there were ſome as big as a Pullets Egg. There were likewiſe ſome *Doubles*: in one we counted ſeventy of them. They were moſt of them worn and conſumed about three quarters, being ſcratch'd by their mutual rubbing,and by that of the Stones,and not by Corroſion cauſed by any humour or acide Spirit, as we found ;becauſe that ſome of theſe *Doubles*, which were hollow on one ſide, and boſſed on the other, were ſo worn and bright on one ſide of the Boſs, that there remained nothing of the Figure of Money : whereas the ſide which was hollow, was not at all damaged, its cavity having defended it from the rubbing of the other *Doubles*. All the reſt which was contained in the *Ventricle* with theſe *Doubles*, as well Stones, and Bones, as Pulſe and Hay, was green. Wee found the ſame thing in the *Ventricle* of a *Buſtard*, where there were Ninety *Doubles* worn by this rubbing: they had likewiſe given a green Colour to a great deal of Hay which was there.

This made us to think that in Birds, and generally in all Animals, the diſſolution of the Nouriſhment is not performed only by ſubtile and penetrating Spirits, but alſo by the Organical and Mechanical Action of the *Ventricle*, which compreſſes and inceſſantly beats the things which it contains; ſo that in the generality of Animals which do ſwallow a hard Nouriſhment without chewing it, (as Birds which live on Grain,) Nature has made their *Ventricle* Muſculous, and has given them the inſtinct of ſwallowing Stones, by the means of which they may break in their *Ventricle* what others do bruiſe with their Teeth. In fine this Affectation which the generallity of Birds have of ſwallowing Stones, has a more manifeſt uſe than that which *Eagles* and *Cranes* have of putting Stones into their Neſts. *Cardan*, and the generallity of other Naturaliſts, are of Opinion that the *Ventricle* of Birds, and eſpecially of the *Oſtrich*, is fleſhy, to afford it more Heat: but it is known that the Muſculous and Fibrous fleſh acts more by its Motion than by its Temper ; and that one of the principal and moſt important Actions of the Heart, is that of Contraction and Dilatation, which ſerves not leſs to the Concoction and alteration of the Blood, than to its diſtribution. It is probable that thoſe who have thought, that the Stones and Iron which *Oſtriches* do devour,are diſſolved in their *Ventricle* by a particular virtue that Nature has given to the *Ventricles* of different Animals ; by which ſome do digeſt Poyſons, others Bones and raw Fleſh ; and that the *Oſtrich* was furniſhed with that of digeſting Metals and Stones, reflected not on that attrition of the Peices of Copper which we have obſerved, and much leſs on the verdure, with which all that was contain'd in the *Ventricle* was tinged. For if the *Ventricle* of the *Oſtrich* had a faculty peculiar for digeſting of Metals, it would digeſt them after the ſame manner as other things are digeſted; which is to be melted and diſſolved, without ſuffering other change in their Colour, than to become white ; which proceeds from the almoſt infinite little bubbles which the boyling of the Fermentation there produceth : For this Ebullition gives a white Colour to whatever it Agitates, as is ſeen in the Froth of Inck, which is white. It is likewiſe known by Experience that the things which are diſſolved in the *Ventricle* do receive an alteration in their Subſtance, without changing Colour ; as it is remark'd in *Craw-Fiſh*, which are found half digeſted,in the *Ventricles* of Fiſhes, with their Natural blackneſs, and not having that redneſs which they do acquire, when the Heat of the Fire Boyls and alters them,after a manner,which is very different from the heat of Animals: So that the greeneſs which happens to Copper in the *Ventricle* of the *Oſtrich*, cannot proceed from a Diſſolvent, that it has to Digeſt Metals; but there is a probability, that the Diſſolution is there made, after the ſame manner as if it ſhould have been done out of this *Ventricle*, if the Copper had been champed with Herbes, or ſome acid or ſaline Liquor, of what Nature ſoever it were, and which ſhould be very different from this acid or ſalt; or elſe from that general Diſſolvent (whatever it be,) of all that is capable of affording Nouriſhment: So that it is credible that the *Oſtrich* being a Voracious Animal, which has need of Swallowing ſome hard thing, that is requiſite, as has been ſaid, to break its Nouriſhment; it miſuſes the inſtinct which Nature has given it for that end, when it Swallows Iron, and eſpecially Copper, which is turned into Poiſon in its Stomach, inſtead of turning into Nouriſhment. And indeed, we were informed by thoſe who look after theſe Animals in the Aviary of *Verſalles*, that the *Oſtriches* which do Swallow much Iron, or Copper, do all Dye preſently after.

The *Inteſtines* in our Subjects were different in length, altho' the Animals were almoſt of the ſame ſize. In one they were fifty Foot, in another fourty two, in a third thirty three, in a fourth twenty nine. The three ſmaller *Inteſtines*, had ſcarce more length than the *Colon* and *Rectum* together. The *Cæcum* was doubled, as in moſt other Birds: each comprehending two Foot in length, more or leſs, in proportion to the length of the other *Inteſtines*.

The External Surface of the *Colon* and *Cæcum* were uneven, with ſome very regular Boſſes, but different in each of theſe *Inteſtines*. Theſe Boſſes were formed by ſome leaf-like Ligaments, which were on the inſide, almoſt the ſame as they are ſeen in the third and fourth *Ventricle* of Animals which chew the Cud. In the *Colon* theſe leaves were tranſverſely ſituated, each making more than half a Circle, and being alternately placed; ſo that the ends of two Semicircles, did receive and include the extremity of another Semi-circle, as if one did put the Teeth of two Combes within one another. Theſe Semi-circles were half an Inch diſtant from each other, and were but three Lines broad in their middle, and went leſſuing to nothing. All along this *Inteſtine*, in the Poſteriour Part, there was a Ligament two Lines broad, which being in length a third leſs than the *Inteſtine*, did contract it, and make the Interiour and Semi-circular Ligaments to Form the Folds and Boſſes, which appeared ſtill more obſervable, when the *Inteſtine* being blow'n up, the whole Membrane, which was not retained and held by the Ligaments, was extended by the impulſion of the Air. All the Veſſels entered at the ſide of this Ligament, to diſtribute themſelves into the *Inteſtine*, but particularly into the Leaves. This Structure of Leaves tranſverſely ſeated in the *Colon* hath already been obſerved in the *Ape*, where mention is made of the diſcovery that we have made, of ſuch Leaves in the *Jejunum* of Man; but we deferred to give the Figure thereof till we came to the *Oſtrich*.

The *Cæcum* was likewiſe furniſhed with Leaves on the inſide, or rather with one ſingle Leaf, which turned like a Screw from one end to the other, almoſt after the manner deſcribed in the *Sea-Fox*, and as it is in *Hares*, and *Rabits*. This Leaf was of the ſame breadth, *viz*, five Lines every where:

It went only ſomewhat contracting towards the extremity of the *Inteſtine*, proportionally as the *Inteſtine* is leſſened, which went pointing, as in moſt *Quadruped's*, and contrary to the Nature of Birds, where this *Inteſtine* keeps the ſame breadth throughout its whole length, and which ſomtimes increaſes it ſelf, as we have obſerv'd in the *Pintado*, where this enlargement is more conſiderable, than in any other Bird that we have ſeen.

At the extremity of the *Rectum* there was a great Bladder fill'd with Urine, to the quantity of eight Ounces: It might contain ones two Fiſts. The Membranes which compoſed it, were like to thoſe of the *Inteſtines*; but they were a little thicker. In one of our Subjects, which was a Female, this Bladder was diſſeminated on the inſide with a great number of Veſſels, which came as it were from a Center, and ſpread over its whole capacity: Theſe Veſſels were not viſible in the other Subjects. Directly over this Center, was the hole through which the *Rectum* emptied it ſelf into the Bladder 'Twas a very ſtraight hole, in the middle of a Tumour of about the bigneſs of a Nutt, which made as it were a *Hen's* Arſe. At the bottom of this great Bladder there were likewiſe two holes, which were the Mouthes of the *Ureters*, which did run betwixt the two *Tunicles* of the Bladder, like to that of *Terreſtrial* Animals. Underneath theſe two holes was an oval Aperture ten Lines in length, which had a Membranous border, by the means of which it might be cloſed, when it came to be compreſſed by the weight of the Urine: For then this Membranous border joyned it ſelf to a ſwelling or round Body, being of about the bigneſs of ones Fiſt, of a middle Subſtance between a Cartilage and a Ligament. This *Tuberoſitie* was cleft in the middle after the manner of an *Apricock*, being faſtened on the inſide to the *Os Pubis*.

This Oval Aperture gave paſſage into a ſecond Bladder or Pouch, leſſer than the firſt, and which was not made to containe the Excrements, but only to give them paſſage, according as its *Tunicle* did more or leſs compreſs, and cloſe the *Tuberoſitie* which did fill it, by an Action like to that of the Membranous border of the Oval Aperture.

The *Penis* in moſt of our Subjects was compoſed of two Subſtances, *viz.* of white, thick, Nervous, ſolid Membranes, and of white Ligaments, of the ſame Subſtance as the Membranes, but a great deal harder and more ſolid, having neither in the Membranes nor in the Ligaments any Veſſels, nor Cavity: They appear'd compoſed only of tranſverſe *Fibres* very compact. The external Membrane which covered the whole *Penis* was the thickeſt: The internal did immediately invelope each of the two Ligaments, which were ſeparated from each other, and were united about two Fingers from the extremity. There was one longer than the reſt; the longeſt was two Inches: They were each four Lines Diameter towards their *Baſis*, going pointwiſe towards the extremity. The Origine of this *Penis* was at the Cartilaginous ſwelling which was faſtened to the internal part of the joyning of the *Os Pubis*, of which it is juſt before ſpoken; from thence it was reflected turning ſhort downward, entred into the little Pouch, and came out at the external orifice of this little Pouch, which is the *Anus*. This Aperture was bordered with a Semicircular fold, which embraced the *Penis*, at the place where it went out. In ſhort this *Penis* had neither *Gland*, *Præpuce*, *Ductus*, nor *Cavity*, which might give paſſage to any Seminal Matter. In one of the Subjects, beſides the Membranes and Ligaments which compoſed the *Penis*, there was alſo a third Subſtance, red, Spongious, and much reſembling that of the Cavernous Ligaments of *Terreſtrial* Animals. It was garniſhed with a great quantity of Veſſels.

In the Female, inſtead of the *Penis*, there was only the Cartilaginous Swelling, which filled the ſecond Pouch as in the Male ; and this Tumour came out of the *Anus* about the bigneſs of a ſmall Nutt: It had a little Appendix about three Lines long, thin, and bent back. It is likely that this is the *Clitoris*.

In this little and ſecond Pouch, there was on the left ſide a hole into another Cavity, in manner of a Paſſage, which was the *Oviductus*. This Hole exceeded not four Lines in Diameter: It had wrinkles all round, after the manner of the external Orifice of the Females of *Quadruped's*. In one of our Subjects the Tunicle of this *Ductus* were very thick, and its Cavity very large near the entrance: In another it was leſs; and about five Inches beyond the entrance, it was contracted to Form another Paſſage five Lines long, hard and Nervous, which might paſs for the internal Orifice of the Matrix. Underneath this Strait Paſſage, there was a little Bag or Pouch, not perforate, the depth of which was equal to the length of the Paſſage. In the Subjects where this ſtrait Paſſage was not found, the *Oviductus* contracted it ſelf, from its firſt entrance ſtill as it approached the *Ovarium*; ſo that at its extremity it exceeded not four Lines in breadth, inſtead of three Inches and a half, which it had at its middle. In this extremity it formed that Hole which is called the *Infundibulum* or Tunnel of the *Oviductus*, and ſent forth, on the right and left ſide, two Membranous Appendices, which had ſome ſimilitude with thoſe that are at the extremity of the *Tuba* of *Terreſtrial* Animals.

This whole Paſſage, which is properly the *Matrix* or *Cornua Uteri* of Birds, was two Foot and a half long, and capable of receiving ones Fiſt in its largeſt part. It was fleſhy at the beginning, and became inſenſibly Membranous towards its end. After having aſcended, by turning on the left ſide towards the *Ventricle* it was reflected towards the Back-bone, deſcending. A double Membrane, in form of a large Ligament, faſtened it: It had an Edge the length of two Inches on each ſide: The hinder part of this Ligament was faſtened along the Back-Bone, like a Meſentery: the Anteriour was looſe. Both were intermixt with a great number of Veſſels, which were in greater quantity on the Paſſage of the *Oviductus* than in the Ligament. Theſe Veſſels did come from two great Branches which entered through the extremity of the *Oviductus*, towards the *Ovarium*: the one went along the top, the other the bottom; and their Branches had ſome *Anaſtomoſes* with each other, *viz.* thoſe of the lower part with thoſe of the upper.

The whole Paſſage of the *Oviductus* was compoſed of three Membranes. except the extremity, which makes the *Infundibulum*, which ſeem'd to be of a ſingle Membrane. The Interiour of theſe Membranes was mightily wrinkled, or rather as it were leaved, after the manner of the third and fourth *Ventricle* of Animals that chew the Cud. Theſe Leaves, which filled all the Cavity, went lengthwiſe, and a very thin Tunicle joyned them together. The ſecond Membrane, which was that of the middle, was fleſhy. The third, which was thin and ſleek, was nothing but the double Membrane, of which the broad Ligament was compoſed, which was divided in two to embrace the Paſſage of the *Oviductus*.

We obſerved four Muſcles, appertaining to the *Anus* and *Penis*: There were two on each ſide. The two firſt took their Origine from the internal part of the *Os Sacrum*, and deſcended along the Pouch of the *Rectum*, for the ſpace of two Lines: they peirced it near its extremity, and paſſing under the *Sphincter* of the *Anus*, inſerted themſelves at the *Baſis* of the *Penis* in the Males, and at that of the *Clitoris* in the Females. The two others went from the internal part of the *Os Ilium*, towards the bottom of the Kidney's; and deſcended at the ſides of the *Vreters*, and alſo pierceing the *Rectum*, faſtened themſelves to the ſides of the *Penis* and *Clitoris*.

The *Ovarium* was placed at the upper part of the Kidney's againſt the *Vena Cava* and *Aorta*, being ſtrongly faſtned to the Truncks of theſe Veſſels, and garniſhed with ſeveral Eggs, covered with their skins as in Hens. Theſe Eggs were of a different ſize, *viz.* from the bigneſs of a Pea to that of a Nutt. The Membrane, which included each Egg, and which in *French* is called *le Calice*, had as it were a Tail, by which theſe Eggs are commonly connected alltogether, and do compoſe that which is called the *Ovarium*. This Membrane was the thicker the leſſer the Eggs were: It had a great quantity of Veſſels, and was faſtened to the Egg which it incloſed, by an infinity of Fibres, being open towards the place oppoſite to the Tail, as is the Cup of an Acorne, when the Acorne is round and ſmall, and when it is almoſt all covered with its Cup. The Egg being ſeparated from the *Calice* or Cup, was only a very delicate Coat, which contained only the Yolk of the Egg, in thoſe which were not bigger than a Nutt; but in one of our Subjects where it was found about the bigneſs of two Fiſts, this Coat was filled with a humour like unto muddy Water, excepting that it was yellow. There is ground to believe that the Natural Heat weakened in this Animal, by the contrariety of the Air of our Climate, had corrupted theſe Eggs.

One of the *Oſtriches* which are in the Park of *Verſailles*, having lay'd ſeveral Eggs, ſome were brought to us, on which there was made ſome Obſervations and Experiments. For as theſe Birds do not ſit on their Eggs, but expoſe them to the Ray's of the Sun and the Heat of the Sand, contenting themſelves with ſecuring them from the Rain, by laying them on little hillocks of Sand; we reſolv'd to try whether by the Heat, as well of the Sun, as of the Fire, and Dung, we might at leaſt procure in them any Alteration, that might ſeem a Diſpoſition to Generation. For this end there was one kept five weeks in the Sun, half buried in Sand, on a Bed of Dung raiſed three Foot from the Ground, covering it with a Glaſs Bell during the ill weather. Another was put into an *Athanor* with a gentle Fire, keeping it alſo, for the like ſpace of time, in Sand and well covered. We obſerved ſeveral things, *viz.* That the Eggs diminiſhed a ninth part of their weight; That the yolk and white of that which had been heated in the Fire, were ſomewhat thickened, without having any ill Scent: That which had been lay'd in the Sun was not thickened, but had contracted a very ill Smell: And that in neither the one nor the other of theſe Eggs, there was found any appearance of Diſpoſition to Generation.

At the top of the *Ovarium* there was diſcovered two Glandulous Bodies faſtened to the *Aorta*, and *Vena Cava*, whoſe Subſtance was like to that of the Teſticles of the Males, having in their Superficies a great number of Veſſels. Their Colour was of a briſk red. Each of theſe Bodies meaſured an Inch and half in length, and four Lines in Diameter.

In the Males the *Teſticles* were of a different Size and Figure in the different Subjects. In one they were ſmall, being only fifteen Lines in length and five in Diameter. In another they were long and narrow, being an Inch and half long and four Lines only in Diameter. In a third they were four Inches long, and an Inch and half Diameter through the middle. Theſe laſt had the Figure of a *Pullets* Egg a little extended, being larger at one end than the other. In all the Subjects they were covered with a Nervous Membrane, Sprinkled with ſo great a quantity of Veſſels, that it appeared red. In one of the Subjects we found the *Teſticle* had as it were another little one, faſtened to its ſide. This little one was about a fourth of the great one, and was nothing elſe but the *Epididymis* ſeparated from the *Teſticle*, which was joyned to it in two places; *viz.* by a Branch of the *Vas Spermaticum Præparans*, which proceeding from the middle of the *Teſticle*, did enter into the middle of the *Epididymis*; and by the *Deferens*, which proceeding from the bottom of the *Epididymis*, was rejoyned to the bottom of the *Teſticle*.

The *Vaſa Præparantia* came out near the *Emulgents*, and were joyned a little lower to the *Teſticles*, which were laied on the Kidneys, a little more on the left than on the right ſide: Before their connecting to the *Teſticle*, they were each divided into three Branches, which joyned to each other, and afterwards ſeparating, did thus continue to communicate themſelves along the *Teſticle*, to which they inſerted ſome Branches at equal Spaces. In this place they were exceedingly invelop'd with Membranes and Fat: But notwithſtanding theſe Impediments, their Structure and Communications were diſtinctly ſeen; becauſe that having boiled one *Teſticle*, and all the Fat being melted, the Veſſels evidently appeared, and ſhewed that after being united, they were ſeparated, to rejoyn again. The *Deferens* deſcending along the *Spine* to the ſecond Bladder, was there faſtened, after being dilated, and changed into a Membrane. This *Ductus*, as uſually, was ſolid, and without Cavity at its beginning, and at the end it was enlarged, and became Membranous.

The *Liver* was red, of a Subſtance hard and firm. By its Figure it reſembled that of a Man, being divided into two great Lobes. The left was parted into two other ſmall ones. There was alſo another little one, in the middle and at the bottom of the two great ones, which was found but in one of the Subjects. There was no *Gall-Bladder*, but only a *Ductus Hepaticus*, which proceeded from the middle of the hollow part of the Liver, and inſerted it ſelfe at the *Pylorus*. The *Ductus* was formed by the uniting of three great branches, which were diſtributed into the whole Subſtance of the Liver. At the extremity of one of theſe Branches, very near its Inſertion into the *Ductus*, there was a Dilatation about the bigneſs of a great Filbeard, which did not appear becauſe it was again covered over by the *Parenchyma* of the Liver.

The *Vena Porta* was double, having two ſeparate Truncks, and each their particular roots. The firſt, which was the bigger, was faſtened to the right Lobe, at the place where the *Gall-Bladder* commonly is in Birds. The ſecond (the leſſer) came out from the bottom of the left Lobe. The *Vena Cava* was joyned along the great *Diaphragme*, right by the ſide of the *Aorta*.

The *Pancreas* was ten inches long, and an inch broad: It was placed between the firſt fold, which the *Inteſtines* do make in forme of a long Sinuoſity as in moſt other Birds. It was of a true fleſh-Colour. The Glands whereof it was compoſed were wholly ſeparated from each other, and joyned only by Membranes. The *Ductus Pancreaticus* was knitt to the upper part of the *Iejunum*. It proceeded from the middle of the *Pancreas*, where the two branches joyned, which it ſhot forth into each half of the *Pancreas*, one towards the top and the other towards the bottom. It is remarkable that in the Generalitie of Birds, the *Ductus Pancreatici* are inſerted near the *Cholidochi*; but in our *Oſtriches* the inſertion of the *Pancreaticus* was above three foot diſtant from that of the *Hepaticus*.

The *Spleen* was faſtned to the Ventricle by a ſtrong Membrane, which conducted and held the Splenatick Veſſels. It was Cylindrical, being two inches and a half long, and Eight Lines Diameter; yet it was a little ſmaller at the bottom than at the top. Its *Parenchyma* was Solid, and like to that of the Kidneys of *Quadrupedes*.

The *Kidneys* comprehended eight inches in length, and two in breadth. In moſt of our Subjects they were different from the Kidneys of other Birds, not being cut into ſeveral Lobes, but having a continuity very equal. Their whole Subſtance, which was quaggy, appear'd moreover very unequal, as being compoſed of a great quantity of Glands. They had a very fine *Membrane*, that immediatly covered them, which was again covered over with another ſtronger and thicker, ſupplying the uſe of the *Membrana Adipoſa*. The colour of theſe Glands was of a very brisk dark Red. In ſome of our Subjects we found the Kidneys were cut in three as uſually, the upper and lower part being larger than that of the middle. The *Vreter* was not, as in other Birds, lay'd upon the Kidneys from top to bottom, but it was included in their Subſtance, where it was a little larger than outwardly, as it were to form a *Pelvis*, which was about the length of the Kidney. In this *Pelvis* there was ſeen ſeveral holes, which were the Mouths of the Branches or Channels which the *Pelvis* ſends into the whole Subſtance of the Kidney. There was not any appearance of *Papillæ*.

The *Rings* which compoſed the *Aſpera Arteria*, were intire, but a little compreſſed, which gave them an Oval Figure. The *Larynx* conſiſted of one *Cricoides*, and one *Arytænoides*. The *Cricoides* reſembled that of a Man, and the *Arytænoides* was made of two flat and large Cartilages, articulated with the *Cricoides* by the means of their Muſcles. Between them they left an Aperture of ſix Lines, which made the *Glottis*. Theſe two Cartilages were covered over with one Muſcle, which plainly ſerv'd to cloſe the Mouth of the *Glottis*, by drawing them together.

The *Diaphragme* was not ſingle, as in terreſtrial Animals, where there is but one Partition, which ſeparates the Parts contained in the *Thorax* from thoſe of the lower *Venter* : But there were ſeveral *Diaphragmes*, which made a great many ſeparations, by dividing the Cavity of all this part of the Body, which is called the Trunck, into ſix other Cavities, by the means of five Partitions, which may be taken for as many *Diaphragmes*.

There were four of theſe *Diaphragmes* or Partitions, whoſe Situation was direct from top to bottom, and a fifth ſeated a Croſs. Of the four ſtrait ones, two were little, and two great; the little ones covered the Lungs, which were faſtened to the ſides, and ſeparated them from the four upper Bladders of the Lungs. The great *Diaphragmes* which covered theſe Bladders, as the little Ones covered the Lungs, left a great ſpace in the middle where the Heart and Liver were included together. The fifth *Diaphragme*, which was ſeated croſs-wiſe, going from the middle of one of the great *Diaphragmes* to the middle of the other, ſeparated the Heart and Liver from the Gizzard, the Inteſtines and other parts of the lower Belly, in which the two inferiour Bladders of the Lungs were likewiſe held. So that the ſix Cavities were, a great one of the lower *Venter* ; another great one of the middle of the *Thorax*, ſeated over the firſt; two middling ones at the ſide of the ſecond, which contained the four upper Bladders ; and two little ones at the ſide of theſe middling ones, where the right and left Lungs were incloſed.

Each of the little *Diaphragmes*, (which we call the *Muſcle* of the Lungs, becauſe that it was fleſhy, and covered the Lungs,) had its Origine very fleſhy, which was divided into ſix heads faſtened towards the extremity of the great Ribbs, near the Angle which they do make with other little Ribbs that faſten them to the *Sternum*, inſtead of the Cartilages which knitt them in Terreſtrial Animals. Theſe ſix Heads did altogether produce a large Tendon or *Aponeuroſis*, which being couch'd on the Lungs, went to joyn it ſelf with the *Aponeuroſis* of the other oppoſite Muſcle, on the *Vertebræ* of the Back, to which it was alſo ſtrongly connected. The direction of the Fibres of this Muſcle was Oblique, inclining a little towards the bottom, ſo that its Action is to contract the *Thorax* by cloſing the Ribbs, and drawing them downwards.

Each of the great *Diaphragmes*, which was only a Membrane without Muſculous fleſh, and conſequently without Action, and ſerving only for a partition, has ſeemed to us to meritt rather the name of *Diaphragme*, than the two little ones that were Muſculous, and alſo than the *Diaphragme* of Terreſtrial Animals, which ſerves for other purpoſes than to ſeparate the upper Belly from the lower; being principally imployed by its Motion in the Reſpiration which is called free, as are the Muſcles of the *Thorax* for the Reſpiration which is called Violent and forced, the which is performed by the Dilatation and Conſtriction of the *Thorax*. Each of theſe *Diaphragmes* was joyned at the top, and at the fore-ſide, along each Ribb of the *Strnum*, which was very broad in our *Oſtriches*, as it commonly is in Birds. At its back-part it joyned to the *Aponeuroſis* of the Muſcle of the Lungs, and by the means of this *Aponeuroſis* to the *Vertibræ* of the Back: At the bottom it was faſtened to the tranſverſe Muſcle of the lower *Venter*.

The Tranſverſe *Diaphragme* was ſeated a little lower than the bottom of the *Sternum.* It proceeded from the middle of one of the great *Diaphragmes* and cleaving on the forepart to the Tranſverſe Muſcles of the lower Belly and on the hind-part to the *Aponeuroſes* of the Muſcles of the Lungs,it went to faſten it ſelf to the other great *Diaphragme.* Underneath it was garniſhed with Fat about the thickneſs of ones Finger.

The *Lungs*, being included between the Ribbs and little *Diaphragmes*,called by us the Muſcles of the Lungs, were compoſed of two Red and Spongious fleſhy parts, as in other Birds. They were each ten inches long and three and a half broad, being an inch and a half thick. Each of the two Branches of the *Aſpera Arteria*, entring into the Lungs, was divided into ſeveral branches, which were diſtributed into its whole *Parenchyma*, as in Terreſtrial Animals, except that all theſe Branches were ſimply Membranous without any Cartilages. The Air paſſing into theſe branches, went to the external ſurface of the *Parenchyma* which was pierced with an infinite number of little holes, which were ſeen through a very thin Coat, wherewith the whole Lungs were covered to incloſe the Air,and let it out only thro five holes, each about five lines Diameter, and ranked according to the length of the Lungs, ſome towards the Back-bone, others towards the *Sternum*. Thoſe holes which were towards the *Sternum*, piercing the fleſhy part of the Muſcle of the Lungs to penetrate into the Bladders, were oblique; and it ſeem'd to be thus formed that the Air might be voluntarily retained in theſe Bladders by the Action of the Muſcle, which, by contracting it ſelfe, might leſſen this hole, for ſome uſes which may be conjectured, as it ſhall be explained in the ſequel.

The four Bladders which were on each ſide at the top of the *Thorax*, were included, as has been ſaid, between the *Diaphragme* and the Muſcle of the Lungs wherewith they were covered over. The Coat of each Bladder was faſtened by the ſides of the *Diaphragme* and Muſcle of the Lungs. At the top and bottom it was joyned to the Coats of the Neighbouring Bladders between which it was. The fifth Bladder, which was a great deal larger than the reſt, was not included between the *Diaphragme* and the Muſcle of the Lungs, but between the two *Diaphragmes* with the *Inteſtines* and other parts of the lower Belly; and that they toucht the Muſcle of the Lungs only at the place where it was Pierced, to give paſſage to the Air that it received from the Lungs. In *Eagles* and ſome other Birds, we found theſe Bladders faſtned by the bottom to a Membrane exceedingly loaded with Fat, which incloſed as in a Sack the *Ventricle* and *Inteſtines*, and which we have taken for an *Epiploon*.

The parts of this Structure could not be ſo well obſerved in other Birds, by reaſon of the tenderneſs of the Coats whereof theſe Bladders are compoſed, which in the *Oſtrich* are about the thickneſs of a Hog's Bladder; and we found thoſe of the lower Belly in one of our Subjects four times thicker, being Scirrhous: But in moſt other Birds it is almoſt impoſſible not to cut them in making the Diſſection, and they can be well viewed only, by keeping them extended by blowing into the *Aſpera Arteria*. This knowledg of this Structure gave the Society an occaſion of making ſeveral Reflections on the manner of Reſpiration in general, and on that particular to Birds, to indeavour to arrive at the knowledg of the uſes which theſe Organs muſt have, which are ſo different in the one and the other of theſe Animals.

It was conſidered that Reſpiration ſerves not only to the refreſhment of the Heart, and to the Voice, but that it is alſo uſeful for the Concoction and Diſtribution of the Nouriſhment, by the continual agitation and conſtriction of the *Thorax*, which preſſing the Lungs fill'd with Air, and by this Means rendered like ſoft Pillows, makes that they gently ſqueeze out, not only the Blood contained in their Veſſels, and puſh it into the Heart; but do alſo compreſs the other Veſſels ſhut up in the *Thorax*, to favour the diſtribution of the blood, as it appears in violent Actions, where the retention of Reſpiration is neceſſary; for it is obſerved that it makes the blood to riſe up into the Face. But the manner whereby Reſpiration is accompliſht by Inſpiration and Expiration, does evidently demonſtrate the verity of this uſe in terreſtrial Animals; for Inſpiration is performed when the *Thorax* is inlarged by the changing of the ſituation of the Ribs and *Sternum*, which renders its capacity more ample; and by the relaxation of the Diaphragme, which likewiſe diminiſhes the Capacity, becauſe that it makes it to mount on high, and take up a part of the *Thorax*. Now this Relaxation, which is a thing paſſive, is not ſufficient for the powerful effort that Expiration requires, becauſe that the Air incloſed and compreſſed by the Action, which the Pectoral Muſcles do cauſe in Reſpiration, would be capable of forcing the Diaphragme downwards, if not thruſt upwards by ſome power which acts ſtrongly in Expiration. This Power is double; one is that of the *Mediaſtinum*, which after having been drawn and extended in the inſpiration, when the center of the *Diaphragme* deſcends downwards, do's afterwards draw the ſame Center upwards, as do's Spring, which after having been forc'd returns to its firſt State, by an Action which *Galen* calls Natural, and which is not volentary like that of the Muſcles; ſo that he attributes to it the involuntary retraction which happen's to the parts, by Muſcles whoſe Antagoniſts have been cut. The other power which makes the *Diaphragme* to aſcend, is that of the muſcles of the lower Belly, which may paſs for the Antagoniſts of the Diaphragme, when they do compreſs whatever is contained under the Diaphragme. For by this Action making the Liver, *Ventricle*, and other parts of the lower Belly to riſe up, they force the middle of the Diaphragme upwards; which afterwards deſcends, when by its proper Action, which is Extenſion, it again takes the ſtrait and flat figure which the Contraction of the Fibres do give it. This compreſſion of the Muſcles of the lower *Venter* on the *Viſcera* is ſo powerful, that the *Ventricle* has been ſomtimes obſerved to have been puſht into the capacity of the *Thorax*, when the Diaphragme had received a great Wound: as *Paræus*, *Sennertus*, and *Hildanus* do teſtifie.

By theſe Actions of the compreſſion of the Muſcles on the *Viſcera* making them to aſcend, and of that of the Diaphragme making them afterwards to deſcend, and by the continuity of theſe alternate Motions, it may be ſaid that Reſpiration is, in reſpect of the the Humours contained in the lower *Venter*, what the Pulſation of the Heart is in regard of the blood contained in its *Ventricles*; that is to ſay, that this compreſſion and agitation ſerves not only to the diſtribution of the Chyle, as that of the Heart ſerves to force the blood into the Arteries, but that it is one of the principal cauſes of the generation of the ſame Chyle, by the diviſion, attenuation and mixture of the parts of the Food which this continual agitation is capable of producing.

Theſe Actions which are eſſentially neceſſary for Life, and which muſt be porformed in Birds as in terreſtrial Animals, are there alſo perform'd by Reſpiration; altho' with different Organs; for tho' the Diaphragme of thoſe Birds that have it muſculous, or at leaſt the Muſcle of the Lungs in the *Oſtrich*, has ſome Tenſion and Relaxation, by the means of which, the Lungs and its Bladders are compreſt, it has not that Motion which it has in terreſtrial Animals, by which the *Viſcera* are ſomtimes forc'd upwards, ſomtimes downwards; and the Muſcles of the lower *Venter*, by reaſon of their ſmallneſs, cannot compreſs them but very feebly, becauſe that almoſt all the lower Belly is covered with the *Sternum*, whoſe ſize muſt be exceeding great, as it is, to give riſe to the great Muſcles which do draw the Wing downwards; the force of theſe Muſcles being unable to anſwer the powerful Action of flight, if they were leſs. So that this weakneſs of the Muſcles of the lower *Venter* and Diaphragme; muſt be ſupply'd in Birds by the Bladders of the Lungs, which are alternately filled and emptied in their Reſpiration; and the manner of their acting is thus.

When the *Thorax* is dilated by the Action of the Pectoral Muſcles, the Air enters into the Lungs, and at the ſame time from the Lungs into the Bladders; but it muſt be underſtood that it enters only into thoſe which are incloſed in the *Thorax*, becauſe that there is nothing which, by dilating the Bladders contained in the lower Belly, can give occaſion to the Air to enter in; for on the contrary it is then that they ſhrink, and that the Air which they contain re-enters into the Lungs. But when afterwards the *Thorax* is compreſſed and contracted, the Air lockt up in the Bladders of the *Thorax*, being thereby ſqueezed out, one part goes out through the Larynx, the other enters into the Bladders of the lower Belly, and ſwells them at the ſame inſtant that the upper ones are evacuated; and afterwards when the upper Bladders are filled by the dilatation of the *Thorax*, they do receive, not only the outward Air thro' the *Larynx*, but alſo that of the Bladders of the lower Belly, which are compreſſed at the ſame time that the upper ones are dilated; and this happens to them, as well by reaſon that their Coats do return into their firſt ſtate, by the force of their Spring as becauſe that the *Viſcera*, which have been forc'd and compreſſed by the dilatation of the Bladders, do in their turn force them, aided by the Muſcles of the lower Belly, notwithſtanding their ſmallneſs. This makes a Reciprocation and Viciſſitude of Impulſions, which ſupplys the potent Action, produced by the great Muſcles of the lower Belly, in terreſtrial Animals. This Action of the Bladders, which ſerve for the Reſpiration of Birds, is plainly ſeen, when they are diſſected alive. We have made the Experiment thereof in great Birds, as *Geeſe* and *Turkey-Cocks*, in which having open'd the lower Belly, without hurting the Bladders which are there; it was remarked that when the *Thorax* was depreſſed in the Expiration, the lower Bladders did ſwell; and that when it was dilated for Inſpiration, they did ſhrink.

This particular manner which Birds have in their Reſpiration, may be explain'd by the Bellows of Forges, which ſeem to have been made after the imitation of the Organs of the Reſpiration of Birds: For theſe Bellow's have a double capacity to receive the Air. The firſt is that underneath, which receives the Air when the Bellows is opened, and this capacity repreſents the upper Bladders ſhut up in the *Thorax*. The ſecond capacity is that above, which repreſents the Bladders of the lower Belly: For when the inferiour capacity is contracted by the compreſſion of the Bellows: The Air which it has received enters through a hole with which it is pierced, and paſſes into the upper capacity; ſo that the Air forceably thruſt, do's enlarge this capacity, by making the upper board to riſe; this hole being in the middle board between them, which is as it were a *Diaphragme* between the two Capacities that compoſe the Bellows, which are different from thoſe of the Bladders of the Lungs of Birds, in that their ſituation is different; the capacity of the Bladders which do firſt receive the Air, being in the Superiour part in Birds, and in the Inferiour in the Bellows of Forges. The Society has likewiſe made on ſeveral other Birds ſome Remarks concerning the Reſpiration of theſe kinds of Animals, which will be found in their Deſcriptions.

The *Heart* was almoſt round, being ſix Inches from the *Baſis* to the point, and five in breadth. Birds have it generally longer in proportion. The *Auricles* were ſmall, and the *Ventricles* great. The Aperture of the *Vena Cava* was very large, without any Valves: There was only as it were a Sack, whoſe ſide (which was a partition between its Cavity and the Mouth of the *Vena Cava*) did ſerve for a Valve, which might be called *Sigmoides*. This Structure is common to the Heart of Birds. The other Valves were in the other Veſſels of the Heart as uſually.

The *Aorta* deſceded along the right ſide as in other Birds, being ſhut up in a *Capſula* formed by the *Aponeuroſis* of the Muſcles of the Lungs.

The *Skull* was ſoft: In one of the Subjects we found a Fracture. Naturalliſts have obſerved that when the *Oſtrich* fears any danger, it thinks it ſelf in ſafety, when it has hid its Head.

The *Cerebrum* with the *Cerebellum* was but two inches and a half long, and twenty Lines broad. The *Dura Mater* divided not the Brain in two by that large Production called the *Falx*; but in the Subſtance of the Brain there was obſerved only a ſmall Ray ſomewhat deep, on which the *Dura Mater* was a little thickned, and applyed to it making as it were a Seame.

The *Sinus Longitudinalis* went as vſually from the forepart to the hindpart of the Head, to terminate at the meeting of the *Sinus Laterales*, which were fixed at the place where the *Dura Mater* ſeparates the *Cerebrum* from the *Cerebellum*. Theſe two *Sinus's* came out of the Skull through ſome particular holes of the *Occiput*, to diſcharge themſelves into the Internal Jugulars. The fourth *Sinus*, which was ſeated a great deal backwarder than in *Terreſtrial* Animals, did obliquely deſcend downwards, and dividing into two Branches, entred into the *Ventricles* of the Brain.

The *Dura Mater* being taken away, we found the *Glandula Pinealis* layd upon the place where the *Cerebellum* is joyned to the *Cerebrum*: It was about the bigneſs of a little Pea: ſeveral Branches of the *Lacis Choroides* invelop'd it. The *Pia Mater* was ſtrewed with a great Number of Veſſels. The Surface of the Brain which it covered, was not divided into ſeveral Sinuoſities and Circumvolutions, but ſmooth and even, as it is commonly in Birds. The whole Anteriour part of the Brain was divided into two parts, which were connected together only by ſome very ſlender *Fibres*. The ſeparation of theſe two parts, which in *Terreſtrial* Animals goes to the Callous Body, was abſolutely of the whole Brain, which was united only by the Poſteriour Part, near the *Cerebellum*. This ſeparation and diviſion of the Brain into two Parts is found in moſt Birds; and it is well known by Quacks and Mountebanks, who gain a Reputation to their Balſome, by curing Hens, after having run a Knife through their Head, which they eaſily do between theſe two Parts of the Brain, without killing them. In each of theſe two Parts there was a Cavity or *Ventricle*, which was covered over with a white, medullary Subſtance, half a Line thick, which was alſo extended over the place by which theſe two parts are joyned together, and where the Anteriour *Ventricles* did meet in a third. In this third there was a cleft terminating at the *Infundibulum* and *Glandula Pituitaria*, which exactly ſhut the end of the *Infundibulum* or Tunnel, being ſituated as uſually on the *Os Sphenoides*. At the Poſteriour Part of the two Anteriour *Ventricles* there was ſeen the *Lacis Choroides* formed by a Branch of the *Carotide*, and a branch of the fourth *Sinus*. Almoſt all the Subſtance of the Brain was of an Aſh-colour, and like to the Cortical Part of a Man's Brain, ſo that in proportion to that which is medullary, it was ten times bigger and thicker.

The ten Pairs of Nerves took their riſe, and came out of the Skull after the ſame manner as in *Terreſtrial* Animals.

The *Spinalis Medulla*, which took its Origine from the place where the two parts of the Anteriour Brain are joyned together and with the *Cerebellum*, had at its ſides two round Eminencies, about the bigneſs of a ſmall Nut. They had each a conſiderable Cavity, and did Form as it were two *Ventricles*, opening themſelves into the Inferiour *Ductus*, which paſſes under that which is called *Sylvius's* Bridg, and through which the Seroſities of the *Cerebellum* are diſcharged into the *Infundibulum*.

In the *Cerebellum* the Cortical and Medullary Parts were diſpoſed after the ſame manner as they are ſeen in *Terreſtrial* Animals; theſe different Parts appearing on the outſide to be ranged by Plates joyned to each other, and diſtinguiſhed by parallel Lines. There were two *Apophyſes Vermiformes* as in Man. There was alſo a *Ventricle* of the ſhape of a Pen, as in the generality of *Terreſtrial* Animals, The *Cerebellum* on the inſide was compoſed as ordinarily of a white Subſtance, like Branches of Trees, and of another red and livid Suſtance,

The Figure of the *Eye*, like as in other Birds and Fiſhes, was compoſed of two Semi-Globes, the greateſt of which formed by the *Sclerotica* had its flat part before; the other, a great deal leſs, was laid on the flat of the *Sclerotica*. This little Semi-Globe was the *Cornea*, which had all round a raiſed Circle, making as it were a Border. The *Optick Nerve* did not enter at the middle, but a little at the ſide towards the Angle, which the convexity of the *Sclerotica* makes with the flat part. The *Cryſtalline* had no kernel, but its Subſtance was uniform: It was more convex on the inſide than on the out. The *Choroides* was intirely black, without having in the bottom that various coloured and as it were gilded Membrane, which we call the *Tapetum.*

The *Optick Nerve*, having pierced the *Sclerotica* and *Choroides*, was dilated, and formed as it were a Tunnel of a Subſtance like its own. This Tunnel is not ordinarily round in Birds, where we have almoſt always found the extremity of the Optick Nerve flatted and compreſſed on the inſide of the Eye. From this Tunnel proceeded a folded Membrane, making as it were a Purſe, which ended in a point towards the border of the *Cryſtalline,* neareſt the entrance of the Optick Nerve. This Purſe, being ſix Lines at the bottom, at its coming out of the Optick-Nerve, and going pointwiſe towards the top, was faſtened by its point to the border of the *Cryſtalline,* by means of the Membrane which covered it on the ſide of the Vitreous Humour, and which did alſo cover the whole Purſe, that was black, but of another black than is that of the *Choroides,* which appeared like a Spot of Water Colours, which ſticks to the Fingers; For the Colour penetrated the Membrane.

The upper *Glandula Lachrymalis,* which is commonly hid on the inſide of the exteriour Angle of the Orbite, was placed in a cavity ſunk into that Part of the *Coronalis* which goes to make the ſuperiour part of the Orbite: It was eight Lines in length and four in breadth; its Tubes were diſpoſed after the uſual manner.

The Explication of the Figure of the CASSOWARY.

THE lower Figure ſhews that the Head, Neck, and Bunch on the Breaſt are without Feathers; that the reſt of the Body appears rather garniſhed with Hair than Feathers; that the fleſhy Appendices, wherewith the lower Beak of Hens is ordinarily deck'd, are in this Bird at the bottom of the Neck; that the Head is covered with a Creſt like an Helmet; that the Beak is divided at the end; that inſtead of Feathers, the Wings have only five Quills without Beards; and that the Rump and Feet are extraordinary bigg.

In the Upper Figure.

A A. R*epreſents one of the* Feathers, *which are for the moſt part double.*
B. *The* Tongue *with the knot of the* Larynx.
C. *The* Spleen.
D. *The* Splenick Artery.
E. *The* Splenick Vein.
F. *The* Craw.
G. *The firſt* Ventricle.
H. *The ſecond* Ventricle.
I- *An Appendix of the ſecond* Ventricle.
Γ. *The Head of the Appendix which ſtop'd the* Pylorus.
K. *The* Gall-Bladder.
L L. *The* Ductus Cyſticus.
M M. *The* Ductus Hepaticus.
N. *The* Pancreas.
O Q. *The Internal* Eye-lidd *extended over the* Cornea.
P Q P. *The Internal* Eye-lid *drawn from over the* Cornea, *and brought into the great* Canthus *of the* Eye.
P S r Q. *The great* Muſcles *of the Internal* Eye-lid; Q *is its Origine*; P, *its Inſertion*; S, *the* Optick Nerve *on which the Tendon of the* Muſcle *is folded*; r, *the* Aponeuroſis *of the little* Muſcle, *which ſerves as a Pully to the Tendon of the great one.*
R r. *The little* Muſcle.
T T. *The* Glandula Lacrymalis,
V V. *The Veſſels of the* Glandula Lacrymalis.
X a. *The* Ductus Lacrymalis. X, *is its Aperture towards the edge of the Internal* Eye-lid, *through which the Humour is poured on the* Cornea.
Y Z. *The great* Muſcle *extended*; Z, *is its Origine*; Y *its Inſertion.*
a. *The Trunck of the lower* Vena Cava.
b b. *The* Emulgents c c c c. *The* Kidneys.
d f, d f. *The* Epididymis. e e. *The* Teſticles.
d g, d g. *The* Deferentia.
g g g g. *The* Ureter's.

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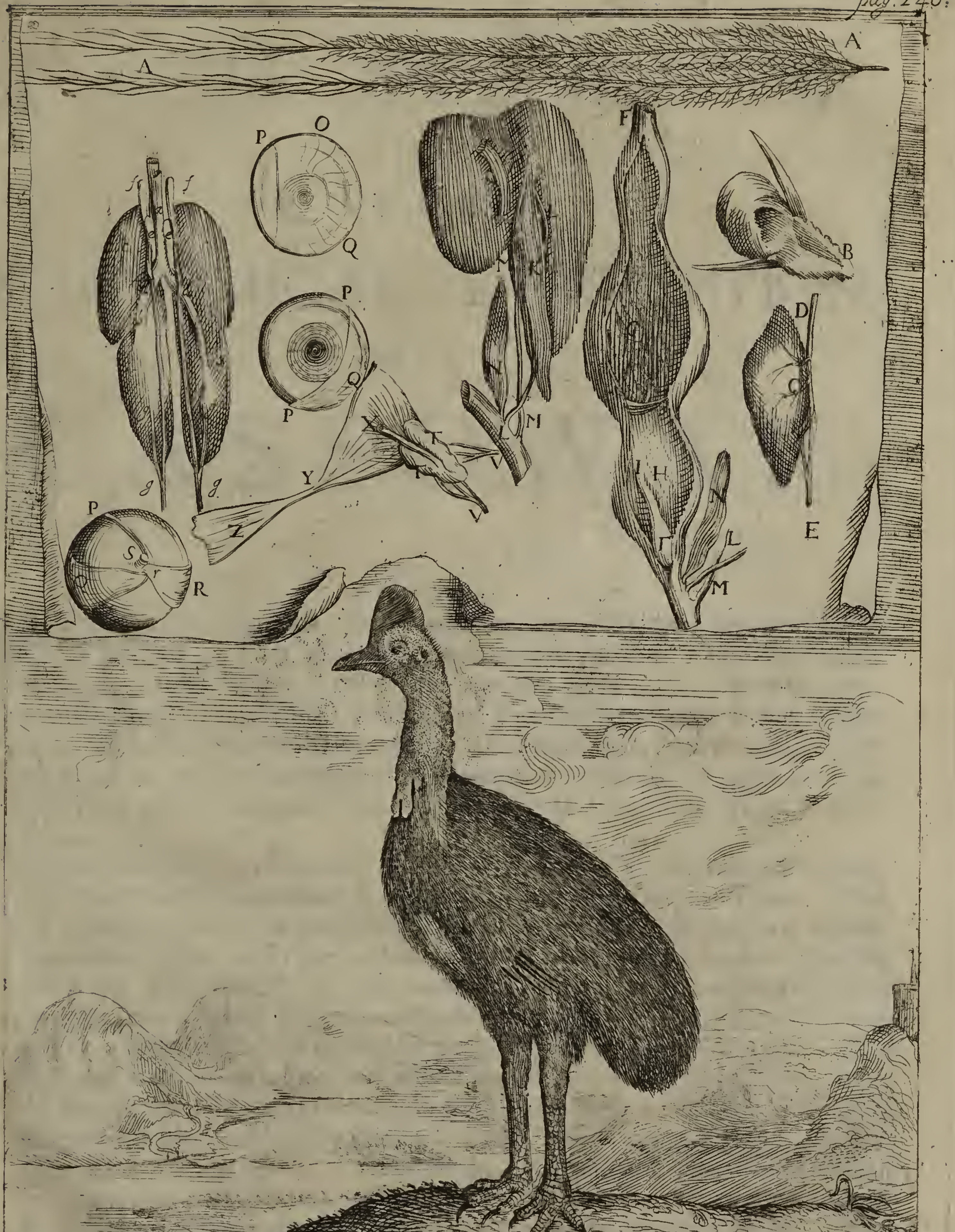

THE ANATOMICAL DESCRIPTION OF A CASSOWAR.

BEfore the year 1597 this Bird was never ſeen in *Europe*; and no Author of the Ancients, or Modernes, has ſpoken thereof. The *Hollanders* brought one at the return of their firſt Voyage from *India*. It was given them as a Rarity by a Prince of the Iſle of *Java*. Six years after they brought two others, but they dyed on the way. That here deſcribed was ſent to the King in 1671, by the Governour of *Madagaſcar*, who had bought it of the Marchants which returned from the *Indies*. It Lived four years at *Verſailles*.

Cluſius ſay's that in the *Indies* it is called *Eme*. We have not yet been able to underſtand wherefore it is in *French* called *Caſuel* or *Gaſuel*. This Bird, next the *Oſtrich*, is the greateſt, and weightieſt of all that we know. That which *Cluſius* deſcribes, which is the firſt that the *Hollanders* brought from *India*, was a fourth leſs than ours, which meaſured five foot and a half in length, from the end of the Beak to the extremity of the Tallons. The legs were two foot and a half from the Belly to the end of the Tallons. The Head and Neck were a foot and a half together. The greateſt Toe, comprehending the Nail, was five inches long; the Nail of the little Toe, three inches and a half. The Wing was ſo little, that it did not appear, being quite hid under the Feathers of the Back. *Aldrovandus*, who has only ſeen the deſcription that is given thereof in the Relation of the firſt Voyage of the *Hollanders*, reports that this Bird is cheifly admirable in that it has neither Wings nor Tongue. In our Subject we found this a falſitie. This Author might alſo have added that it has no Feathers, becauſe that indeed, thoſe which do cover it, do better reſemble the Hair of a Bear or wild-Boar, than Feathers, or Down; ſo harſh, long, and thin are the Fibres which do compoſe the Beards of theſe Plumes.

All theſe Plumes were of one ſort, different from Birds which fly, where there are ſome feathers for flight, and others only for covering the Skin. Our *Caſſowar* had only of the laſt ſort. They were moſt double, having two long Tubes or Stem's proceeding from another very ſhort one, which was faſtened to the Skin. *Cluſius* ſay's that they are alwayes double. In our Subject there were a great many ſingle. Thoſe which were double, were alwayes of an unequal length: Some were fourteen inches long. We have already remark'd this kind of feather in an *Eagle*, and a *Parrot*: But thoſe of the *Caſſowar* had three Particularities. The firſt is that the Beards, which did adorn the Stem from the half to the end, were long and harſh like Horſe-Hair, without caſting out any Fibres, and in this they are different from the Plumes of *Heron's*, whoſe long and ſlender beards are not of ſingle Fibres as they do appear; for they are decked on each ſide with little Fibres, ſo ſhort that they are almoſt imperceptible. The ſecond particularity is, that in this halfe the Stem was not different from the Beards, being neither bigger nor of a different Colour, as is commonly in the Feathers of other Birds. The third particularity is that theſe Beards were perfectly black, and that thoſe of the other half were of a Grayiſh Tawney, ſhorter, ſofter, and caſting forth ſmall Fibres like Downe. Now there was only this part, compoſed of great and black Fibres, that appeared, the other part compoſed of Down being covered over therewith. The different Hairs wherewith the Skin of *Caſtors*, *Boars*, and other Animals which are Subject to wallow in the Mire is covered, are diſpoſed after this manner for the uſes which are explained in the deſcription of the *Caſtor*.

The *Neck* was without feathers as in the *Indian-Cock*. The *Head* alſo had none: It had only ſome Hairs erected on the Crown, eſpecially towards the hind part and on the Neck. There was no Tail; the feathers which did cover the Rump, which was extraordinary great, not being different from the others nor otherwiſe diſpoſed.

The *Wings*, which without the feathers were not three inches in length, were covered with the ſame ſort of Plumes, and did each caſt forth five great Tubes or Stems without any Beards. *Cluſius* puts down but four: They were of different length, according to the diſpoſition, and proportion that the Fingers have in the Hand. The longeſt was eleven inches, being three lines Diameter towards the root, which was only a little bigger than the extremity, which went not pointing but did appear broken, or ragged. Their Colour was of a very ſhining black. We did not think theſe wings could ſerve to aſſiſt it to walk, as *Cluſius* imagines; there being greater probability that it might be thereby aided to ſtrike, as with Switches.

The *Head* appeared little as in the *Oſtrich*, becauſe that it was not enlarged with feathers, as in other Birds. It was covered with a *Creſt* three inches high, like that of a Helmet. This *Creſt* covered not all the Crown of the Head: For it began but a little beyond the Crown, and ended at the beginning of the Beak. It was of different Colours, the fore part being blackiſh, and the hinder-part and ſides of a Wax-Colour. It was every where ſmooth and ſhining like Horn. Its Circumference was like an edg, not exceeding three lines in that place; from thence it went enlarging, and towards its *Baſis* was about an inch. Its Subſtance, which was very hard, appeared to us like Horne, being compoſed of ſeveral *Laminæ* or Plates like the Hornes of Oxen. *Cluſius* ſay's that when the Bird molts the Creſt falls off with the Feathers: Which ſeemed to us incredible, conſidering the ſubſtance of the Creſt, ſuppoſing that it was a Horne: for it was not of the Nature of *Deer's* Hornes which do ſhed, and grow again; and we made enquirie, after this Particularity of thoſe which do look after the Animals of *Verſailles* who for the ſpace of four years, have not ſeen the Creſt fallen. We did heartily wiſh that we had been permitted to examine by the diſſection after what manner this Creſt was joyned to the Scull; *viz.* whether the Scull ſent forth any bony Production into the Cavity of the Creſt, as it is obſerved that there are ſuch in Hornes which are hollow, or whether it is a ſolid Body: but there was an expreſs order from the King to preſerve the Skin of this Animal, to adorn the Aviary of *Verſailles*.

The upper part of the Beak was very hard, at its two edges and at top. The Interſtices on each ſide had but one Membrane, in which were the holes of the Noſtrills, very near the extremity of the Beak. This extremity of the Beak was divided in three, almoſt as in the *Indian-Cock*. The end of the lower Beak was ſlightly indented, being likewiſe divided in three. The whole Beak was of a dark-gray, except a green mark that the lower Beak had on each ſide towards the middle.

The *Eye* was large. Its *Iris* of a *Topaze* Colour, almoſt as in the *Lyon*. There was an internal Eye-lidd, which was hid in the great *Canthus*. The inferiour Eye-lidd, which was the largeſt, was garniſhed with a row of black Hairs. There were likewiſe a row of black Hairs like a Demi-circle, at the top of the Eye, raiſed like an Eye-brow. The hole of the Ear was very great and bare, being only ſurrounded with black Hairs, like the Eyes. There were of theſe very Hairs about the root of the Creſt.

The two ſides of the Head, round the Eye and Ear, were of a blewiſh Colour. The Neck was Purple, inclining to a Slate colour. Behind, it was alſo Red in ſeveral places, but eſpecially towards the bottom; and theſe red places were raiſed a little higher than the reſt, in wrinkles running obliquely croſs the Neck. *Cluſius* ſay's that there are Red Plumes towards the bottom of the Neck, which we have not found in our Subject.

At the bottom of the Neck there were two fleſhy *Appendices*, like thoſe which hang down at the lower Beak of *Hen's*. They were an inch and a half long, and nine lines broad, being rounded at the end. Their colour was like the reſt of the Neck, partly red and partly blew.

At the middle of the Breaſt there was a place without Feathers, about ſix inches long, of an oval Figure, a little Pointed at the top. This place was a *Calloſity*, on which the Bird did reſt, as do's the *Camel*. It was compoſed of a dry Skin, faſtened to a bonie Ligament, very thin, applyed and fixed on the middle of the *Sternum*, by Fibres mixt with Fat, ſo that all this Calloſity was moveable.

The Thigh's were covered with feathers. The Leggs, which were extraordinary great, ſtrong and ſtrait, had ſome Scales. There were ſome *Hexagonal*, *Pentagonal*, and ſquare. Towards the top and hinder-part of the Leg they were ſmall, towards the bottom and fore-part they contained even an inch: On the Inſtep they were like plates, two inches long. The Toes were likewiſe covered with Scales. They were but three in number, having none behind: the leaſt was on the inſide. The Claws were of a hard and ſolid ſubſtance, black on the outſide, and white on the inſide. They were half worn away. *Cluſius* ſay's that this Bird has a prodigious ſtrength in his Feet, with which it ſtrikes, by running backward, in ſuch ſort, that it breaks down Truncks of Trees of the bigneſs of ones thigh. Thoſe that had the care of ours, obſerved it not to be ſo ſtrong nor Furious: they have only remarked that it perſued after Women with great hatred.

The *Oeſophagus* from the *Pharynx* to the beginning of the *Craw*, meaſured ten inches long: it was an inch and half large. The Tunicles whereof it was compoſed were thick. Before the entrance into the Stomach, it was inlarged and grew thinner, making a Craw, which, as in *Hen's* and *Pidgeons*, was half on the bottom of the Breaſt, and half in the *Thorax*. This Craw was eight inches in length, and four in breadth: At the ſtraiteſt place it was two. It was ſucceeded by a ſecond Craw more groſs, and compoſed of Tunicles more thick. This Craw was a foot long, and ſeven inches broad. It deſcended underneath the Liver. Its interiour Tunicle was compoſed of Glands, as the extremity of the *Oeſophagus* commonly is in Birds; and theſe Glands, which are not ſo large, nor ſo well formed as in the *Buſtard*, which is the only Bird in which we have found them moſt diſtinct, were covered over with a yellow Velvet. This particularity makes that this Craw may be taken for the firſt *Ventricle*, which was followed by a ſecond compoſed of thinner Tunicles than thoſe of the firſt. The Internal Tunicle appeared thick becauſe that it was plaited. The Velvet which covered it, was a little thicker than in the firſt *Ventricle*. Theſe two *Ventricles* were ſeparated, and diſtinguiſhed one from the other, not only by their Subſtance, which was different, and by a Contraction ſuch as is ſeen in the different Ventricles of Animals which Chew the Cud, but likewiſe by a Membranous border made like a Valve.

From the middle of the ſecond *Ventricle* there proceeded, on the inſide, an *Appendix* three inches long, and eight broad; 'twas a Production of the Internal Membrane of the *Ventricle*. At the end of this Appendix, there was as it were a Head, of the bigneſs of a *Pullets* Egg, which drawing the Appendix downwards, deſcended into the *Pylorus*, and ſtopt it. There is ground to doubt whether this formation was Natural, or cauſed by diſtemper. We have nevertheleſs thought that it was not Natural, and that there was formed in the internal Membrane of the *Ventricle* a Scirrhus, which by its weight having inſenſibly extended it, had formed this Appendix, whoſe extremity, great and hard as it was, might have cauſed the Death of this Animal, which fifteen days before its Deceaſe, had undergone a kind of Vomiting of whiteiſh water, even to a *Chopine* or *Pariſian* half Pint a day; which was in appearence its Nouriſhment, which could not find paſſage.

'Tis a thing very remarkable that this Animal, which feeds not on Fleſh, but Pulſe and Bread, had not a fleſhy and muſculous Gizzard, as all other Birds which feed on that ſort of Nouriſhment uſe to have; conſidering alſo that in every thing elſe it has ſo much reſemblance with the *Oſtrich*, which has a Gizzard: and that like it, it ſwallows whatever is offered to it, even to burning Coals, according to *Cluſius*; and it muſt be thought, that Nature has ſupplyed the defect of the Gizzard, by the multitude of the *Ventricles* that it has given it, provided with a qualitie particular, and capable of diſſolving the hardeſt and moſt ſolid Aliments. This has ſeem'd credible to us, conſidering in what ſtate the two *Ventricles* and Craw were found: For the *Ventricles* were quite empty, having only the *Craw* that had any thing in it; and the Nouriſhment which it contain'd was more than half digeſted. Which made us to judge of the ſtrength that theſe *Ventricles* muſt commonly have, ſeeing that their Craw had ſo much thereof in one dying Animal.

The *Inteſtines*, were in all four foot eight inches long, and two inches diameter. They were all of one breadth and Subſtance, without leaves on the inſide, withouc Cells and without a *Cæcum*.

The Liver was of a moderate ſize the right Lobe being only eight inches and the left four.It was every where Scirrhous. The Gall Bladder which was faſtened along the right Lobe, and ſhut up in the *Capſula*, was ſeven inches long, and an inch diameter at moſt. The *Ductus Cyſticus*, which proceeded from the top of the Bladder, meaſured eight inches in length, and was enlarged towards its inſertion, which was towards the beginning of the *Duodenum*. The *Hepaticus* was eight inches and a half, and deſcended from left to right, and the *Cyſticus* from right to left, which made that theſe two *Ductus*'s increaſed towards their lower part. The *Hepaticus* was inſerted underneath the *Cyſticus*.

The *Spleen* was three inches long, and an inch and a half broad at its greateſt breadth: It had the ſhape of a *Sole-Fiſh*. Its Veſſels were diſtributed as uſually.

The *Pancreas* was little in proportion to the other parts. It was but two inches in length and two lines in breadth. Its *Ductus*, which was very ſlender was but one line and a half long, and was inſerted above the *Cyſticus*.

The *Kidneys*, as in other Birds, were divided into ſeveral Lobes. They meaſured eight inches in length. The *Vreter's* were of the bigneſs of a *Gooſe-Quill*, and ſeven inches long.

The *Teſticles* were an inch in length, and half an inch in breadth. Their Subſtance was white and hard, and much different from that of the *Epididymis* which was ſoft and yellowiſh; but the ſize was very extraordinary, being three inches long and two lines broad; ſo that it was raiſed two inches above the *Teſticle*. The *Ductus Deferens* deſcended along the Kidney, being faſtened to the *Vena Emulgens*, and afterwards uniting it ſelfe to the *Vreter*. It was eleven inches long, having the bigneſs of a Quill. The *Penis* was placed as in the *Oſtrich*. It comprehended two inches in length, an inch in breadth towards its Baſis, and two lines towards its point. The Skin which covered it was hard, thick and unequal on the inſide, by reaſon of ſeveral folds which were diſpoſed like a Screw. The Body of the *Penis* conſiſted of two Cartilaginous Ligaments, which gave a Piramidal Figure to the *Penis*. They were very hard and ſolid, and ſtrongly connected to each other at the top. They were ſeparated underneath, to give place to a Membranous *Ductus*, with which we could not perceive that the *Deferentia* or *Vreter's* had any communication.

The Lungs meaſured eight inches in length and four in breadth over their middle.

This Bird being the largeſt that we have diſſected next the *Oſtrich*, we applyed our ſelves to obſerve ſome things which do appertain to the Organs of Reſpiration, which have a particular Structure in Birds, and which we begun to diſcover in the *Oſtrich*: For it is not eaſy to perceive well theſe things in leſſer Birds. Amongſt other things we examined two Muſcles, which we do call the Muſcles of the Lungs. Theſe Muſcles had their Origine very fleſhy, which in each was divided into ſix Heads, each faſtned to a Ribb, at the place where the Ribb, which by one end is articulated with the *Vertebræ*, is by the other articulated with another Ribb which is joyned to the *Sternum*. For it muſt be obſerved that the Ribbs of Birds are ordinarily double; and that whereas in Terreſtrial Animals, there are ſome Cartilaginous Appendices which do faſten them to the *Sternum*, they are in Birds real Bones, which are articulated and not joyned *per Symphyſin* with the Ribbs. Now theſe ſix Heads of the Muſcle of the Lungs did all together produce a large Tendon or *Aponeuroſis* which covered the Lungs, and which ſeparated it from the Bladders, into which the Air, after having penetrated the Lungs, enters through the holes with which this *Aponeuroſis* is pierced; and theſe Bladders were again covered over by the *Diaphragme*, even as the Lungs was by the *Aponeuroſis*: So that the Bladders were ſhut up between the *Aponeuroſis* and the Ribbs. This *Aponeuroſis* thus lay'd upon the Lungs, went to joyn it ſelf with the *Aponeuroſis* of the oppoſite Muſcle on the *Vertebræ*, to which it was alſo ſtrongly connected; leaving nevertheleſs upon the middle of the Body of the *Vertebræ*, a void ſpace for the paſſage of the deſcendent *Aorta*, and *Oeſophagus*. At the ſame place where theſe *Aponeuroſes* were connected together, and faſtned to the *Vertebræ*, the *Diaphragmes* were alſo joyned, and united to the *Aponeuroſes*; but towards the left ſide they gave way to a great branch of the *Aorta*, which ſupplyed the place of the *Cœliaca* and *Meſenterica*. This Branch was crept between all theſe *Aponeuroſes*, as well of the Muſcles of the Lungs, as of the *Diaphragmes*, which were joyned together.

The uſe of theſe Muſcles according to our Conjectures, is twofold. The firſt is to ſerve the Motion of the *Thorax*, by drawing it downwards; becauſe that they do go from the Angle which the Ribbs make, by their mutual articulation, and do obliquely aſcend towards the inferiour *Vertebræ* of the Back, to which they are faſtned. The ſecond uſe is to retain the Air lockt up in the Pouches or Bladders, and hinder it from going out with the ſame liberty that it entered in. The uſe of this Retention is not well known to us, at leaſt in reſpect of the upper Pouches: For in regard of the lower ones, the uſe of this Retention has been explained in the Deſcription of the *Oſtrich*, where it was ſhown, that there is a probability that the Air contained in the lower Pouches ſerves to compreſs the *Viſcera*, and make them riſe upwards. Some do think that this Retention of the Air ſerves Birds to render them lighter in flying, like as the Bladder which is in Fiſh helps them to Swim. And this Conjecture would have ſome foundation, if the Air contained in the Bladders of Birds was as light in proportion to the Air in which they Fly, as the Air contained in the Bladders of Fiſh is in proportion to the Water in which they do Swim. But to ſay ſomething, which hath at leaſt a little more probability, waiting till we have a more certain know-

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ledge of the Truth and uſe of this retention of Air, we conſider that the Birds generally riſing very high, and even to the place where the Air is a great-deal lighter than it is near the Earth, might be deprived of the principal advantages of Riſpiration, for want of an Air, whoſe weight might make on the Heart and Arteries the Compreſſion neceſſary to the Diſtribution and Circulation of the Blood; if they had not the faculty of containing a long time a portion of Air, which, being rarified by the heat which this Retention produceth therein might, by inlarging it ſelf, ſupply the defect of the weight, of which the Air that they do breath in the middle Region is deſtitute. For if there are a great many Birds which do never riſe very high into the Air, whoſe Lungs have notwithſtanding theſe Bladders in which the Air is retained; there are alſo a great many that have Wings, which they uſe not for flying: And it may be obſerved that there are found ſome parts in Animals, which have not any uſe in certain Species, and which are given to the whole Genus, by reaſon that they have an important uſe in ſome of the Species. 'Tis thus that in ſeveral kinds of Animals, the Males have Teats like the Females, that *Moles* have Eyes, *Oſtriches* and *Caſſowars* Wings, and that *Land-Tortoiſes* have a particular Formation of the Veſſels of the Heart, which agrees only with *Water-Tortoiſes*, as it is explained in the Deſcription of the *Tortoiſe*.

However it be, the ſtructure of the Muſcles of the Lungs of Birds gives occaſion to believe that they do ſerve to this Retention, becauſe it is ſeen that the holes which they have, to give entrance into the Pouches, are moſt in the fleſhy part of the Muſcles, which is capable of a voluntary Conſtriction and Relaxation. And moreover this Retention of the Air is manifeſt in the *Camelion*, which hath Lungs of a Structure like that of Birds: For we have remark'd that the *Camelion* is ſomtimes ſwelled, as it was ready to burſt, and continues a long time in this poſture, altho' the Reciprocation of the Reſpiration ceaſes not from going its uſual pace; as if by the means of theſe Muſcles of the Lungs, this Animal did retain the Air in ſome of the Bladders, *viz.* in thoſe whoſe Apertures are in the fleſhy part of the Muſcle; and that in the others it leaves a free Egreſs and Entrance to the Air for Reſpiration.

In the middle of the two great *Diaphragmes*, there was a Membrane, which, like a *Mediaſtinum*, deſcended from top to bottom, and which ſerved for a Ligament, to ſuſpend the Heart, Liver, *Ventricle*, and the reſt of the parts of the lower *Venter*.

The Bladders of the Lungs were ſeparable from the *Diaphragmes* and Muſcles of the Lungs, each having their particular Tunicle. Theſe Tunicles were joyned together, making double and not ſingle partitions. The ſecond Bladder had two holes. The fourth deſcended not ſo low as in other Birds, by reaſon that the *Sternum* being very ſmall, and conſequently the Muſcles of the lower *Venter* greater than ordinary, this Bladder was not ſo neceſſary as in Birds which have the *Sternum* bigger: which confirmes the opinion that we have of the uſe which we attribute to this fourth Bladder, and which is explained in the Deſcription of the *Oſtrich*. Now the *Sternum* was proportionably leſſer than in the *Oſtrich*, becauſe that the Muſcles deſigned for the Motion of the Wings, to which it gives riſe, were very ſmall, and proportioned to the Wings.

The *Heart* was an Inch and half long, and an Inch broad towards its *Baſis*. Its fleſhy valve made a Sack, that was but one Line deep,

The *Tongue* meaſured an Inch in length and eight Lines in breadth. It was indented all round like a Cocks Combe. *Aldrovandus* has ſaid that the *Caſſowar* has neither Wings nor Tongue, inſtead of ſaying that theſe parts are of a ſtructure altogether extraordinary in this Bird.

The *Globe* of the *Eye* was very bigg, in proportion to the *Cornea*, being an Inch and half Diameter, and the *Cornea* but three Lines. The *Cryſtalline* was four. The black Purſe which proceeds from the *Optick Nerve*, was as uſually in other Birds.

In this Subject we applyed our ſelves exactly to remark what belongs to the internal Eye-lid, which we have found in the Eyes of all Birds, and in thoſe of the generality of *Terreſtrial* Animals. The particularities of the admirable ſtructure of this Eye-lid, are ſuch things as do diſtinctly diſcover the wiſdom of Nature, amongſt a thouſand others of which we perceive not the contrivance, becauſe we underſtand them only by the Effects, of which we know not the Cauſes: But we here treat of a Machine, all the parts whereof are viſible, and which need only to be lookt upon, to diſcover the Reaſons of its Motion and Action.

This internal Eye-lid in Birds is a Membranous part, which is extended over the *Cornea*, when it is drawn upon it like a Curtain, by a little Cord or Tendon; and which is drawn back again into the great Corner of the Eye, to uncover the *Cornea*, by the means of the very ſtrong Ligaments that it has, and which in drawing it back towards their Origine, do fold it up. It made a Triangle when extended, and it had the figure of a Creſcent when folded up. Its *Baſis*, which is its Origine, was towards the great Corner of the Eye, at the edg of the great Circle which the *Sclerotica* Forms, when it is flatted before, making an Angle with its Anteriour part, which is flat, and on which the *Cornea* is raiſed, making a Convexitie. This *Baſis*, which is the part immovable, and faſtned to the edg of the *Sclerotica*, did take up more than a third of the Circumference of the great Circle of the *Sclerotica*. The ſide of the Triangle, which is towards the little corner of the Eye, and which is moveable, was reinforced with a border, which ſupplys the place of the *Tarſus*, and which is black in moſt Quadruped's. This ſide of the Eye-lid is that which is drawn back into the Corner of the Eye by the Action of the *Fibres* of the whole Eye-lid, which parting from its Origine, proceed to joyn themſelves to its *Tarſus*.

To extend this Eye-lid over the *Cornea*, there were two Muſcles that were ſeen when the ſix were taken away, which ſerved to the motion of the whole Eye. We found that the greateſt of theſe two Muſcles has its Origine at the very edge of the great Circle of the *Sclerotica*, towards the great corner from whence the Eye-lid takes its original. It is very fleſhy in its beginning, which is a large *Baſis*, from whence coming inſenſibly to contract it ſelf by paſſing under the Globe of the Eye, like as the Eye-lid paſſes over it, it approaches the Optick Nerve, where it produces a Tendon round and ſlender, ſo that it paſſes thro the Tendon of the other Muſcle, which ſerves for a Pully, and which hinders it from preſſing the Optick Nerve, on which it is bent, and makes an Angle, to paſs thro' the upper part of the Eye; and coming out from underneath the Eye, to inſert it ſelf at the corner of the Membrane which makes the internal Eye-lid. This ſecond Muſcle has its Origine at the ſame circle of the *Sclerotica,* but oppoſite to the firſt, towards the little corner of the Eye; and paſſing under the Eye like the other, goes to meet it, and imbrace its Tendon, as it has been declared.

The Action of theſe two Muſcles is, in reſpect to the firſt, to draw, by means of its Cord or Tendon, the corner of the internal Eye-lid, and to extend it over the *Cornea.* As to the ſecond Muſcle, its Action is, by making its Tendon to approach towards its Origine, to hinder the Cord of the firſt Muſcle, which it imbraces, from hurting the Optick Nerve; but its principal uſe is to aſſiſt the Action of the firſt Muſcle. And 'tis herein that the Mechaniſme is marvelous in this Structure, which makes that theſe two Muſcles joyned together, do draw much farther than if it had but one: For the inflexion of the Cord of the firſt Muſcle, which cauſes it to make an Angle on the Optick Nerve, is made only for this end; and a ſingle Muſcle with a ſtrait Tendon, had been ſufficient, if it had power to draw far enough. But the Traction which muſt make the Eye-lid to extend over the whole *Cornea* being neceſſarily great, it could not be done but by a very long Muſcle; and ſuch a Muſcle not being able to be lodged in the Eye all its length, there was no better way than to ſupply the Action of a long Muſcle by that of two indifferent ones, and by bending one of them, to give it the greater length in a little ſpace. The inſpection of the Figure will ſerve greatly to the underſtanding of this Deſcription, which the novelty of the thing renders obſcure in it ſelf.

The uſe of this internal Eye-lid, which till now has been deſcribed by no perſon, is not determined. Our Opinion is that it ſerves to clean the *Cornea,* and to hinder that by drying, it grow not leſs tranſparent. Man and the *Ape,* which are the ſole Animals where we have not found this Eye-lid, have not wanted this precaution for the cleanſing their Eyes, becauſe that they have hands with which they may, by rubbing their Eye-lids, expreſs the humidity which they contain, and which they let out through the *Ductus Lacrymalis*: which is known by experience, when the ſight is darkened, or when the Eyes ſuffer any pain, or itching: For theſe Accidents do ceaſe, when the Eyes are rubbed.

But the Diſſection has diſtinctly diſcovered to us the Organs which do particularly ſerve for this uſe, and which are otherwiſe in Birds than in Man, where the *Ductus* paſſes not beyond the *Glandula Lacrymalis.* For in Birds it goes beyond; and penetrating above half way on the internal Eye-lid, it is opned underneath upon the Eye; which is evidently done to ſpread a Liquor over the whole *Cornea,* when this Eye-lid paſſes and repaſſes: as we obſerved it to do every moment.

The Explication of the Figure of the TORTOISE.

THis *Tortoiſe* has ſeveral particularities, which do render it different from thoſe that we have in *France*. Its ſhell is not flat, but very convex. It has but one Shell to cover its Back and Belly. Its Tail is furniſhed with a Horn at the end. Its Paws are not covered with Scales, but with a Skin wrinkled like *Spaniſh Leather*. Its Claws are not ſharp, but blunt and half worn away, and its Jaws toothed like a Saw.

In the Upper Figure.

A B C D. *The right ſide of the* Liver.
A. *A little* Lobe *which covers the* Bladder.
B. *The* Bladder.
C. *The Trunk of the* Vena Porta.
D. *The right* Ramus Hepaticus.
E F G. *The left part of the* Liver.
E. *The left* Ramus Hepaticus.
F. *The* Iſthmus *by which the left and right part of the* Liver *are joyned together.*
G. *The great* Lobe *of the left part of the* Liver.
H H. *The right* Vena Cava.
I I. *The left* Vena Cava.
K. *The* Ductus Cyſticus.
L. *The Trunk of the* Rami Hepatici.
M M. *The Kidneys.*
N N. *The* Venæ Emulgentes, *to which are faſtened two Glands.*
O O. *The* Teſticles.
P P. *The* Epididymides *proceeding from the Kidney, and faſtened to the* Teſticles *by little* Ductus's.
Q Q. *The* Ureter's.
R R. *The* Bladder *opned.*
S. *The Neck of the* Bladder *opned, offering to the ſight two* Carunculæ, *which are the extremities of the* Ureter's, *and two others which are the extremities of the* Deferentia.
T T. *Two holes, which are of the Origine at the* Spongious Ligaments, *compoſing the body of the* Penis.
V V. *A large Muſcle, which includes the* Rectum *and* Penis.
X X. *Two other Muſcles of the* Penis, *which are interlaced with two others marked* y y.
Y. *The extremity of the* Glans.
Z. *The great circular Appendix.*
Δ. *The little Appendix with its two Buttons.*
Φ Φ. *The extremity of the* Rectum *cut lengthwiſe, to diſcover the body if the* Penis.
Θ. *An Aperture between the two* Ligaments, *on which abutts the Neck of the* Bladder.

ψ. *The* Penis *cut a croſs, to diſcover the Cavities of the two* Ligaments *marked ω ω, and the Cavity which ſupplys the place of the* Urethra *marked π.*

Ω Ω Ω Ω. *The great* Ductus's *of the* Lungs.

ξ ξ ξ. *The* Bladders *opening into the* Ductus's.

Λ Λ. *The Auricles of the Heart ſeen on the ſide which touches the Back-bone.*

1. *The Trunk of the left* Vena Cava.

2. *The Trunk of the right* Vena Cava..

3. *The Trunk of the Aorta at the going out of the Heart, forming two Croſſes.*

4. *The left* Aorta.

5. *The right* Aorta.

6. *The conjunction of the two* Aortas..

7 7. *The* Carotides.

8. *The* Artery of the Lungs.

9 9. *The Veins of the* Lungs *which are diſcharged into the* Axillares.

10. *The* Artery *which goes to the* Stomack.

11. *The* Artery *which goes to the* Liver, Pancreas, Spleen, *&c.*

12. *The* Artery *which goes to the* Inteſtines.

13. *The* Heart *in its Natural Situation.*

14. *The Anteriour* Ventricle *of the* Heart.

15. *The* Artery *of the* Lungs *opened, to ſhew its three* Valvulæ Sigmoides.

16. 16. *The* Heart *out of its Natural Situation, being raiſed upwards, and ſeparated from its* Auricles Λ Λ, *which are in their place.*

17. 18. *The two Poſteriour* Ventricles *of the* Heart.

19. *The* Aorta *proceeding from the right* Ventricle. *It is opened to repreſent its three* Valvulæ Sigmoides.

20, 20, 20. *The three* Valvulæ Sigmoides, *which are at the entrance of the* Auricles *of the* Heart.

a b. *Two holes which are the extremities of the* Ductus *by which the two Poſteriour* Ventricles *do commnuicate.*

c d. *Two other holes which do make the Communication of the Poſteriour left* Ventricle *with the Anteriour.*

α α. *The* Cerebrum.

β. *The* Cerebellum.

γ γ. *The* Olfactory Nerves.

δ. *The* Medulla Spinalis.

ε ε. *The* Muſculi Crotaphitæ *cut.*

θ θ. *The* Os Occipitis.

κ. *The* Cartilaginous *Plate or Film which ſtops the hole of the* Ear.

τ. *A* Ductus *which deſcends into the Palate.*

μ. *The Plate or Film ſuſtained by the bony* Stylus *marked ν.*

THE
ANATOMICAL DESCRIPTION
OF A GREAT
INDIAN TORTOISE

THis *Tortoiſe* was brought from the *Indies*; it was taken on the Coaſt of *Coromandel*. It was four Foot and a half long from the extremity of the Mouth to the end of the Tail, and fourteen Inches thick. The Shell contained three Foot in length, and two in breadth. How great ſoever this *Tortoiſe* was, it came not near thoſe of which *Elian* and *Pliny* do ſpeak, which were fifteen Cubits, and every one of which was ſufficient to cover a large Cabine where ſeveral perſons might lodg: But our's was a *Land-Tortoiſe*, and thoſe that *Pliny* and *Elian* do make mention of, were *Sea-Tortoiſes*, where Animals do generally grow much larger than thoſe of the ſame Species which do live upon land. *Elian* declares that *Land-Tortoiſes* are not ordinarily greater than the large Clods turned up by the Plow when the Land is light. The largeſt *Sea-Tortoiſes* which they do take near the *Antilles*, according to the relations we have had thereof, are not above as bigg again as ours.

The Shell and all the reſt of the Animal was of the ſame Colour, *viz.* of a very dark Gray. The upper part was compoſed of ſeveral pieces of a different Figure, tho' the moſt part were *Pentagonal*. All theſe pieces were fix'd and joyned unto a Bone, which like a Skull, encloſed the Intrails of the Animal, having one Aperture before, to let out the Head, Shoulders and fore-Leggs; and another oppoſite, thro' which came out the hinder Leggs and Thighs. This Bone on which the Scales were faſtned, was a Line and half in the thinneſt place; and near an Inch and half in ſome places. It is generally double, there being one upon the back and another under the belly, which, like two Breaſt-Plates or Bucklers, are joyned by the ſides, and tyed ed together by ſtrong and hard Ligaments, but which do nevertheleſs grant liberty for any Motion. *Elian tells* us that *Land-Tortoiſes* do caſt their Shell, inſtead of ſaying their Shells, that is to ſay, thoſe pieces which are fixed on the Bone made after the manner of a Skull. For there is no probability that a *Tortoiſe* ſhould ſeparate it ſelf from this Bone to which all its principal parts are faſtned. And it is true that theſe pieces are of themſelves looſened from this Bone, when the Shell has been ſomtime kept, and the Bone begins to putrify; otherwiſe, to unlooſe them you muſt lay the Bone upon the Fire, the heat of which makes theſe parts eaſily to ſeparate from each other.

At the great Aperture before, there was at the top a raiſed border, to grant more liberty to the Neck and Head for lifting themſelves upwards: And this Inflexion of the Neck is of great uſe to the *Tortoiſe:* For it ſerves them to turn again when they are upon their Back. And their Induſtry upon this account is very admirable. We have obſerved in a living *Tortoiſe*, that being turned upon his Back, and not being able to make uſe of his Paws for the turning himſelf, becauſe that they could bend only towards the Belly, it could help it ſelf only by its Neck and Head, which it turned ſomtimes on one ſide, and ſomtimes on the other, by puſhing againſt the ground to rock it ſelf as in a Cradle, to find out the ſide, towards which the inequality of the Ground might more eaſily permit it to roul its Shell, for when it had found it, it made all its endeavours on that ſide.

The three great pieces of the Shell were upon the Back forwards; they had each in their middle a round Bunch ſtanding up three or four Lines, and an Inch and half broad: The lower part of the Belly was a little hollow; Authors have taken notice that this Cavity is peculiar to the Males. Upon the Back there was a wound, occaſioned by ſome blow that it had received when it was taken. This wound which pierc'd only the Shell and part of the Bone which ſuſtained it, without penetrating on the inſide, was not healed within more then a year which ſhe lived, after her being taken.

All that proceeded out of the Shell, *viz.* the Head, Shoulders, fore-Leggs, Tail, Buttocks and hind-Leggs, were all covered with a looſe Skin, folded in great wrinkles, and beſides that grained like *Spaniſh* Leather. This Skin did not enter under the Shell, to cover the parts which are there encloſed, but it was faſtned about the edge of each of the two Apertures: The Skin of *Sea-Tortoiſes* is covered all along the Leggs with little Scales like Fiſhes.

Albertus ſays that great *Tortoiſes* have a Shell over their Head in form of a Buckler. The Head of our *Tortoiſe* was only covered with a Skin, which was much thinner than that of the other parts. It was ſeaven Inches in length and five in breadth, and did in ſome meaſure reſemble the Head of a Serpent. The lower Jaw was near as thick as the upper. There were no Apertures for the Ears. The Noſtrels were opened at the end of the Mouth by two little round holes, after a uncouth manner. The Eyes were ſmall and frightfull: But we have obſerved nothing in reſpect of the *Tortoiſe*, which may make us to comprehend why *Gillius* and *Geſner*, in tranſlating the words ἐλόταλη ἰδειν, which *Elian* makes uſe of to expreſs the deformity of the *Tortoiſe*, have rendered it *Criſpiſſima aſpectu*, inſtead of *Aſpectu admodum Torvo:* For the *Greek* ſignifies both, and the interpretation of the Tranſlators of *Elian* has nothing of the ſenſe, as the other, which agree with the Deſcription of

Pacuvius, who ſays that the *Tortoiſe* is *truci aſpectu.* The Eye had no upper Eye-lid, being ſhut only by the means of the lower, which is lifted up to the Eye-brow. *Pliny* reports that this is common to all oviparous *Quadrupeds.*

Towards the extremity of the Jaw-bones, at the place of the Lipps, the Skin was hard as a Horn, and keen as in other *Tortoiſes*; but theſe Lipps were jagged like a Saw, and it wanted not on the inſide two rows of real Teeth, although *Pliny* affirms that *Tortoiſes* have neither Teeth nor Tongue.

On each of the fore-Paws it had five Toes, or rather five Nailes; for the Toes were not diſtinguiſh'd otherwiſe than by the Nails, theſe Paws having at the end but one round Maſs, from whence the Nails grew out: The hinder-Leggs had only four. Both the fore and hind-Leggs were very ſhort. The fore ones contained but 9 Inches in length, from the Top of the ſhoulder to the End of the Nails, and hinder Leggs eleven, from the Knee to the end of the Nails. The Nails were long, being an Inch and Half. They were rounded away both above and below, their cutt making an Oval figure; they were blunt and worn away. Their Colour was parti-coloured of black and white, in different places, and without any order. We have obſerved that *Sea-Tortoiſes* have Claws or Nails much ſharper, becauſe that they do not wear them in Swiming, as *Land-Tortoiſes* do in Crawling: We have found ſome that had only four Nails on the fore-Feet even as on thoſe behind. *Albertus* tells us, that there are allways five on each Foot. We have remark'd that tho the *Tortoiſe* goes ſlowly, yet the manner of going which is peculiar to it, muſt wear out its Claws as much as in Animals which run: For it rubs them all againſt the Earth ſingly and one after another; ſo that when it puts down one Paw, it reſts at firſt only upon the hindermoſt Nail, then on the next, and ſo paſſes to the others, even to the fore-Claw by turning its Paw, which is round and bordered with Nails; like a Charriot, which moves its wheels, and imprints the heads of the Nails with which their Circumference is bordred, and makes them to enter into the Earth one after the other.

The Tail was large, having at its beginning ſix Inches Diameter. It was fourteen Inches long, and terminated in a point like an Oxe's Horn. *Cardan* calls it a Nail, which he likens to the Spurr which is behind a *Cock's* Foot, and thinks that it is a Calloſity engendred at the end of the Tail of *Tortoiſes*, which have been formerly cutt off: which is not probable; a *Callus* not being able to obtain a Figure ſo Regular, and ſo exactly rounded as it was in the Tail of our *Tortoiſe.* This Tail after the Death of the *Tortoiſe* was turned on one ſide, and ſo inflexible, that it could never be made ſtrait, what force ſoever was uſed. The ſame inflexibility was found in the Muſcles of the Jaws, which could not be opened otherwiſe than by cutting the Muſcles. *Ariſtotle* has obſerved that of all Animals, the *Tortoiſe* is that which hath moſt ſtrength in his Jaws: For its Force is ſuch, that it cuts in ſunder whatever it lays hold on, even to the hardeſt Flints. We have taken notice, in a ſmall *Tortoiſe*, that its Head, half an hour after its being cut off, did make its Jaws to clack with a Noiſe like to that of Caſtanetts: The ſtifneſs of the Tail, equalling that of the Jaws, makes it evident that the *Tortoiſe* has a great deal of ſtrength in this part to ſtrike with; and that this Horn which it has at the end may ſerve inſtead of an offenſive Weapon.

After having ſawed on both the ſides, the Bone which in manner of a Skull, makes the Cavity in which the Entrails are encloſed, as has been ſaid: And after having quite cutt away a Membrane adhering to the part of this Bone which is underneath, and which makes the Belly, (this Membrane ſupplying the place of the *Peritonæum* towards the bottom, and of the *Pleura* towards the top) the Internal parts which preſented themſelves to view, were the *Ventricle*, *Liver* and *Bladder*, whoſe greatneſs was ſuch, that it covered the *Inteſtines*, and all the other parts of the lower Belly.

The *Ventricle* was placed underneath the Liver, to which it was faſtned by means of ſeveral Veſſels. It was nine Inches long, and three diameter. Its Tunicles were very thick, its Orifices ſtrait, and the Membrane which makes the Velvet was folded and bearing forms like Leaves extended according to its length. It had the Figure of the *Ventricle* of a *Dog*; *Severinus* attributes to it that of the *Ventricle* of a *Man*.

At the end of the *Ventricle*, the *Inteſtine* which one may call the *Duodenum*, had in its inner ſide Plaits or Folds like the *Ventricle*. Their Figure was Reticular; which might give occaſion to believe that it was a ſecond *Ventricle*. The reſt of the *Inteſtines* were compoſed of very thick Membranes. The ſmall-Gutts were one Inch diameter, and nine Foot long: The Valve of the *Colon* was formed by a circular fold of the Internal Membrane of the *Ileum*. There was not found in the *Ileum*, nor *Colon*, the Leaves that we have obſerved in the generality of Animals. We found no *Cæcum*. *Severinus* attributes two *Cæcums* to the *Tortoiſe*, reſembling thoſe which are found in Birds. The *Rectum*, at nine Inches diſtance from the *Anus*, had a contraction like the Rump of a *Hen*, round which there were three round Appendices of a different ſize, which ſeem'd formed by the Internal Membrane of the *Rectum*; and which were covered over with fleſhy Fibres extended according to the length of the Appendices. The reſt of the *Rectum* which reached from the contraction to the *Anus*, did ſerve as a Caſe to the *Penis*, as is obſerved in the *Caſtor*, *Civet-Cat*, and ſeveral other Animals. Among the ſmall Water *Tortoiſes* we have diſſected; there was found towards the extremity of the *Rectum*, two Bladders, which had communication with the *Inteſtine*, and which ſwelled when that was blow'n up. Theſe Bladders have not been found in great *Tortoiſes*.

The *Liver* was of a ſolid Subſtance, but its colour pale; it was of a conſiderable bigneſs, and ſeemed as if it were double, being ſeparated into a right and left part, which were joyned together only by an *Iſthmus* of one Inch broad, and by Membranes which did convey Veſſels from the left part to the right. Each of theſe parts had a *Vena Cava* proceeding out of the Convexity which faceth the *Diaphragme*, and each of them a *Ramus Hepaticus* going out of the hollow part. The left part of the Liver was the greateſt, being divided into four Lobes. The firſt and biggeſt was on the left ſide: The ſecond, whoſe bigneſs was of a middle ſize, was under the firſt. The third, which was ſomwhat leſſer, was extended towards the right part, and produced the *Iſthmus* by which the two parts were joyned together. The fourth was lengthened like as the third, over which it was ſituated, to go joyn it ſelf to the right part, to which it was faſtned only by a Membrane and ſome Veſſels, which this Membrane did convey from one part to the other; ſuch a like a like Membrane did joyn the two laſt Lobes. The right part of the Liver had but three Lobes. The firſt and greateſt was the higheſt. The ſecond was under it; 'twas by this Lobe that the left part of the Liver was joyned to the right, by the means of the *Iſthmus*. The third Lobe, which was the leaſt, iſſued out from the middle of the Cavity of the great Lobe, and did cover over the *Veſicula* which was faſtned in this place, being incloſed in a *Sinus* or Cavity, which hindred it from riſing without the Liver, as it uſually does. It contained an Inch and half in length, to half an Inch in breadth. Its Figure reſembling that of the *Veſicula* of a *Man*. The *Canalis Cyſticus*, (which as in *Man*, was the continuation of the Neck of the *Veſicula*) was ſeven Inches long, and as big as a little writing Pen. It deſcended without having any Communication with the *Hepaticus*, and was inſerted into the *Duodenum*, by a particular Aperture. The *Hepaticus* was double, as has been ſaid. The right had ſeveral apparent Branches, which like Roots, were extended into the Lobes of the right part of the Liver. The left had none of the apparent Branches, but it formed a Trunk, which, immediatly iſſuing out of the Liver, did joyn it ſelf to the Trunk of the right *Hepatick*, joyntly to making but one Trunk, which went to inſert it ſelf into the *Duodenum* near the *Cyſtic*.

The *Vena Porta* had its Trunk in the right part of the Liver, between the the firſt and ſecond Lobe. It ſhot forth a great Branch along the *Iſthmus*, producing ſeveral Branches which were diſtributed into the left part of the Liver.

The *Vena Cava*, as has been ſaid, had two Trunks, one right and the other left, which did penetrate the *Parenchyma* of the Liver, with which they were covered over near three Inches in length.

The *Spleen* was between the *Duodenum* and the *Colon*. It had the Figure of a Kidney, and received its Veſſels by a depreſſion like that which the Kidney has for the receiving its own. The Arteries did come from the Branch which diſtributes it ſelf to the Liver and *Duodenum*. The Veins were Branches of the *Meſenterick*.

The *Pancreas* ſtraitly embraced the *Duodenum*. It was likewiſe faſtned to the Spleen, which it partly covered. It had the Figure of a Triangular Priſme. Its *Ductus* was opened into the *Duodenum*.

The *Kidneys* were four Inches long, and three broad, in the form of a Triangular Priſme, of a brisk red, divided into three or four pieces joyned together by their Veſſels, and encloſed by the exteriour Membrane. The emulgent Veins proceeded only from the right *Vena Cava*, which was quite taken up in two great Branches, the ſhorteſt whereof, which exceeded not an Inch, did enter into the right Kidney. The longeſt which had three Inches, paſſed on to the left; their entrance was towards the lower part of the Kidney. The *Ureters* iſſued from the ſuperiour part, and run along the whole Surface, to which they were faſtned as in Birds: There was a glandulous Body an Inch long, ſix Lines broad, and very thin, which was ſtrongly connected to each of the Emulgent Veins. 'Twas in appearance a *Glandula Renalis*.

The *Teſticles* were layd upon the Reins. They were two Inches and a half in length, and ten Lines in breadth. The *Epididymis* was of a particular Structure: 'Twas a *Ductus* folded into ſo many Circumvolutions, that being unfolded, it contained fourteen Inches, whereas before it had but four: This *Ductus* did not ſeem to proceed from the *Teſticle*, but only from the Kidney to which it was faſtned. Having made an Injection of a coloured Liquor into this *Ductus*, a great many other little *Ductus*'s were made to riſe, which did not appear before, and which went from the *Teſticle* to the *Epididymis*: Theſe *Ductus*'s being encloſed in the Membrane which retained the Circumvolutions of the *Epididymis*, and which faſtned it to the *Teſticle*.

The *Bladder* was of an extraordinary bigneſs. There was found in it above twelve pounds of clear lympid Urine: *Ariſtotle* tells us that the *Sea-Tortoiſe* has the Bladder very large, and the *Land-Tortoiſe* very ſmall. Nevertheleſs ours was a *Land-Tortoiſe*: And in the Diſſection which we have made of ſeveral *Water-Tortoiſes*, we have always found their Bladder a great deal leſs in proportion than that which we do Treat of. This makes us to think that there is an Errour in the Text of *Ariſtotle*, by the tranſpoſition of the words *Terreſtial* and *Marine*; ſeeing that the Reaſon which *Ariſtotle* alledges for the greatneſs of the Bladder of *Tortoiſes*, does not well conclude to make us clearly underſtand that the *Terreſtial* ought to have it leſs than the others. For he ſays, that *Tortoiſes* not being covered with a Skin, whoſe Pores can aſſiſt in that Tranſpiration, which in other Animals conſumes a part of the Moiſture of the Body, and greatly diminiſhes the matter of the Urine; this Animal muſt neceſſarily have a great Receptacle for theſe Moiſtures, which the thickneſs and hardneſs of the Shell retains and includes; But he ſay's not that the Shell of *Sea-Tortoiſes* is thicker than that of the Land, nor that they do drink more: And according to *Ariſtotle*'s Reaſoning, Fiſhes which are known to have no Bladder, ought to have one very large.

The Figure of the Bladder of our *Tortoiſe* was altogether as extraordinary as its greatneſs. It was made in the ſhape of a Gutt, and its Neck was not at one of the ends, but at the middle; which does indifferently well repreſent the *Membrana Alantoides* of the *Fœtus* of moſt Brutes. This Figure is very different from the Figure of the Cheſtnut which *Severinus* gives it: It had two Foot in length. Its ſituation was Tranſverſe, going from one of the Flanks to the other. Its Exteriour *Tunicle* was Membranous: The Interiour was ſtrengthened by an infinite number of fleſhy Fibres emboſſed, which were croſſed and interlaced one within the other, imitating thoſe which are ſeen on the inſide of the Auricles of the Heart: Theſe Fibres had their Origine towards the Neck, and diſperſed themſelves thro' the whole extent of the Bladder. The uſe of theſe Fibres is without doubt like that of the Fibres of the Auricles of the Heart, where they do ſerve to ſtraiten and contract their Cavity, for preſſing out what they contain. For the *Tortoiſe* not having like other Animals, a Belly flexible, and garniſht with Muſcles which might compreſs the Bladder, this part ought to have in it ſelf a particular Principal of Compreſſion, by the means of which it might diſcharge it ſelf of what it contains.

The Neck of the Bladder was an Inch in length and as much in breadth. It was faſtned towards the middle of the *Rectum*, into which the Urine was diſcharged by a little Aperture or Oblique *Ductus* ſeven or eight Inches from the *Anus*. Within this Neck there was four little Teats, the two greateſt of which were the Extremities of the *Vaſa Spermatica Deferentia*: They were about a Line in length. The two other leſſer were the extremities of the *Ureters*.

The *Penis* which was encloſed in the *Rectum* as in a Caſe, as has been ſayd, contained nine Inches in length, and an Inch and half over. It was compoſed of two round Ligaments, of a ſpongious Subſtance, and covered over with a fine Membrane. They were layd one againſt the other, and knitt together, not only by their Extremities, *viz.* near the *Glans*, and towards the root, which was at the Internal and lower part of the *Os Pubis*; but likewiſe by their Superiour part, for all their length, by the means of the Membrane of the *Rectum*, which was firmly faſtned to them in this place, without adhering to them in other places, as by the ſides and lower part. This Membrane was extraordinary ſtrong at the place where it was joyned, containing near two Lines in thickneſs. The reſt was thinner and of a blackiſh Colour: Theſe Ligaments thus connected, did leave underneath a Cavity in the form of a Gutter, like to that where the *Urethra* is generally plac'd in other Animals. But in this which had no *Urethra*, this part was ſupplyed by a Cavity, which the Ligaments themſelves did form with the Tunicle of the *Rectum* only, at the time of the Evacuations which ought to be made by this *Ductus*. This did certainly happen by the ſwelling of the Ligaments, which being conſtringed by the Tunicle of the *Rectum* which embrac'd them, left a vacuity in the form of a *Ductus*, between the Tunicle of the *Inteſtine* and the Ligaments: For theſe Ligaments, tho' conſtringed, did not ceaſe to keep ſomthing of their roundneſs, by reaſon of their ſwelling: And this made a triangular Cavity, the two ſides of which, formed by the ſides of the Ligaments, were Convex, and the third formed by the Tunicle of the *Inteſtine*, was ſtrait. Each of the two Ligaments was not only Spongious, as it is ordinarily in other Animals, but they were hollow with a long Cavity in form of a Pipe, which went from the *Os Pubis*, where was the Origine of the Ligaments, as far as the *Glans*. The Veſſells which were ſent into the body of the *Penis*, had a particular diſtribution: For whereas the Artery, Vein, and Nerve, do uſually all three run upon the *Penis*, there were but two in our Subject: And the Vein, after having formed a Net work, and ſeveral Circumvolutions towards the root of the *Penis*, did penetrate into the Ligament, and producing a Trunk, which running along the Internal and Superiour part of the Cavity, ſent forth ſeveral Branches, into all the reſt of the internal Surface of this Cavity. The Structure of the *Glans* was yet more Extraordinary than all the reſt. Above it terminated in a point, and appeared to be the continuation of the Ligaments, not differing therefrom, neither in its Subſtance nor its Tunicle. Underneath it had two flat and almoſt circular Appendices, placed one upon the other. The greateſt, which was faſtned to the *Glans* underneath, was an Inch and half in diameter: The leaſt, which was fix'd to the middle of the greateſt, contained but half an Inch. It had moreover two little Appendices, like two buds about the bigneſs of a Line: All the *Glans* was of a Colour like to that of the Inferiour part of the Tunicle of the *Rectum*, which ſerv'd as a Caſe to the *Penis*; 'twas of a very dark ſlate Colour: There were two Muſcles ſerving to draw the *Glans* inwards. They took their Origine from the *Vertebræ Lumbares*, and paſſing along the ſide of the *Rectum*, inſerted themſelves at the upper part of the *Penis*, near the *Glans*.

Towards the middle, they were interlaced with two other Muſcles, appointed for the Motion of the Tail, and which ſerved them as a Pully.

The *Heart* was ſeated in the upper part of the Breaſt, being cloſed in a very thick *Pericardium*, and faſtned by the lower part of the Membrane which covered the Liver. Its Figure differed greatly from that which the Heart generally has. For inſtead of being extended from its *Baſis* to its point, its greateſt dimenſion was from one ſide to the other; being three Inches this way, and an Inch and a half only from the *Baſis* to the point. The two Auricles which proceeded from the *Baſis*, were very looſe, and as it were hanging down. The right had two Inches and a half in length, to an Inch and half over: the left was leſſer. The *Vena Cava*, which, as has been ſaid, had two Trunks proceeding, the one from the right part of the Liver, and the other from the left, convey'd the Blood thro' each of theſe Trunks into each of the Auricles. Theſe Auricles, as uſually, opened each into a *Ventricle*, and at each of the Apertures which gave paſſage to the Blood from the Auricle into the *Ventricle*, there were three *Valvulæ Sigmoides*; which, contrary to what is uſuall in this kind of *Valve*, hindred the Blood from going out of the Heart to return into the Auricles, performing the Office of the *Valvulæ Tricuſpides*

Beſides theſe two *Ventricles* which were in the hinder part of the heart which faceth the Spine, there was a third in the fore-part, inclining a little towards the right ſide. Theſe three *Ventricles* were communicated by ſeveral Apertures, their Subſtance not being ſolid and continued as in the Hearts of other Animals, but Spongious and compoſed of Fibres and fleſhy Columns, contiguous only to each other, and interwoven together. Beſides the ſtrait Apertures which were between theſe Columns, there were others more capacious, by which the two Poſteriour *Ventricles* had communication together, and with the Anteriour *Ventricle*.

The two hinder *Ventricles*, as has been ſayd, did recieve the Blood from the two Trunks of the *Vena Cava* with the Blood of the *Pulmonique* Veine, which was double, there being one on each ſide: For theſe Veins emptying themſelves into each Axillary, did mix the Blood that they had received from the Lungs with that of the *Vena Cava*, to carry it into the right *Ventricle*, from which the *Aorta* did proceed. The Anteriour *Ventricle* had no other Veſſel than the *Pulmonique* Artery: This Artery, as well as the *Aorta*, had three *Valvulæ Sigmoides*, the action of which was to hinder the Blood, which is got out of the Heart, from re-entring, when the *Ventricles* have dilated themſelves to receive the Blood of the *Vena Cava* and the Lungs.

This uncommon Structure of the *Ventricles* and Veſſels of the Heart muſt have ſome particular uſes, on which we will not declare our Conjectures ſupported on different Experiments, till after having ſhewn that the Structure of the Lungs is not leſs extraordinary: For the one and the other Structure is thus extraordinary in theſe parts, by reaſon of the particular Actions that they have in *Amphibious* Animals, of which kind the *Tortoiſe* is.

The *Aorta*, at the end of the right *Ventricle*, was divided into two Branches, which formed two Croſſes. Theſe Croſſes, before they were quite turned downwards, did produce the *Axillares* and *Carotides*. Afterwards the left Croſs deſcending along the *Vertebræ*, did caſt forth Branches: The firſt was diſtributed to all parts of the *Ventricle*. The ſecond went to the Liver, *Pan-*

creas, *Duodenum*, and Spleen. The third furniſhed Branches to all the *Inteſtines*. Afterwards it was united with the Branch of the right Croſs, which deſcended ſo far without caſting forth any Branches, and both formed but one Trunck, which deſcending along the Body of the *Vertebræ*, gave Branches to all the parts of the lower Belly.

The *Larynx* was compoſed, as in Birds, of an *Arytenoides* and *Cricoides*, articulated together. The two Bones, which do each make one of the Horns of the *Hyoides*, were not articulated the one to the other, but each ſeparately in different places of the *Baſis* of the *Hyoides*. The Cleft of the *Glottis* was ſtrait and cloſe, apparently to keep the Air a long time encloſed in the Lungs, for uſes which ſhall be afterwards explained. It may be alſo believed, that this ſo exact incloſure is to prevent the Water from entring into the *Aſpera Arteria*, when the *Tortoiſes* are under Water: And this particular Conformation of the *Glottis* may be the Cauſe of the Snoring of the *Sea-Tortoiſes*, which as *Pliny* reports, is heard a great way when they do float ſleeping upon the Surface of the Water. The *Sea-Calves*, which are likewiſe remarkable for their Snoring, have alſo their *Glottis* and *Epiglottis* extraordinary cloſe, as has been remarked in the Deſcription of this *Amphibious* Animal.

The *Aſpera Arteria*, which had its Rings intire, was ſeparated at the entrance of the Breaſt into two long Branches of ſix Inches each. From the entrance of the Lungs theſe Branches did looſe their Cartilages, and produced only Membranous Channels very large and unequal, containing even an Inch and half in ſome places, and half an Inch only in others. The Membrane that formed theſe Channels was tranſparent and thinn, but ſolid and fortified with Ligaments linck'd together after the manner of a Nett, compoſed of ſeveral Maſhes, like to thoſe that are ſeen in the ſecond *Ventricle* of Animals that ruminate. Each of theſe Maſhes, was the border and entrance of a little Pouch, which opened into a ſecond, and that ſomtimes into a third. The Branches of the Veins and Arteries of the Lungs did run along the Ligaments, of which they did accompany all the Diviſions, equally diſtributing the Blood into the whole extent of the Lungs. The Authors that have thought that the *Tortoiſe* has no Blood in the Lungs, have grounded this opinion on the whiteneſs and tranſparency of the Membranes whereof they are compoſed, which do make it to appear altogether Membranous when it is ſwelled; whereas that of other Animals appears fleſhy: But the truth is, that the only difference is that of more and leſs: The Lungs of *Man*, after the ſame manner as that of other Animals, being compoſed of nothing elſe but ſmall *Veſicles* heapt one againſt the other, amongſt which the Sanguinary Veſſels are interlaced in ſo great a number, that they do form an appearance of fleſh, like little Lobes faſtned to the Channels of the *Bronchi*; and 'tis of theſe little Lobes that the great Lobes of the Lungs are compoſed.

Yet this difference, of more and leſs fill'd with Blood, has ſeemed to us to paſs for eſſential, and ſufficient to eſtabliſh a *Species* of Lungs, which is one of three to which we reduce the Lungs of the Animals that we have diſſected: For we have found Lungs which did appear abſolutly fleſhy, others abſolutly Membranous, and others partly fleſhy and partly Membranous. The Lungs of all four footed Terreſtrial Animals, which lay no Eggs, and ſome of the *Amphibious*, as the *Sea-Calf*, are of the firſt *Species*: And theſe Lungs do abſolutely appear fleſhy, becauſe that the Blood is equally diſperſed thro' all their Subſtance, into which it Circulates entirely, making all the Blood to paſs thro' the Lungs by its Veſſels from one *Ventricle* of the Heart to the other. The Lungs of *Tortoiſes*, *Serpents*, *Frogs*, *Salamanders*, *Camelions*, &c. are of the ſecond *Species*; And they appear abſolutely membranous, having but very little Blood diſperſed into their Subſtance, *viz.* only that which is neceſſary for their particular Nouriſhment: So that there is no other Circulation made in its Veſſels but of this Nouriſhment. The Lungs of Birds are of the third *Species*, and they do appear partly fleſhy, and partly Membranous, by reaſon that the part which is faſtned to the Ribbs is filled with a great quantity of Veſſels, by which the Circulation is entirely made as in Terreſtrial Animals: and the other part, which is divided into eight and ſomtimes into ten great Bladders, has no Veſſels, and the Circulation therein is only for its peculiar Nouriſhment.

Theſe three *Species* of the Lungs may be reduced to two, if their differences be taken from the uſe which the Lungs have, in relation to the entire Circulation of the Blood: And in this caſe the Lungs of *Tortoiſes*, and other *Amphibious* Animals of that kind, will make a particular *Species*, their Lungs being uſeleſs for the entire Circulation. And the Lungs of Birds, and that of Terreſtrial Animals, will make another *Species*, which will be common to thoſe whoſe Lungs appear abſolutely fleſhy, and thoſe that appear only in one part. For the eſtabliſhing theſe two *Species*, there may be likewiſe added another difference taken from the Motion of the Lungs, which in Terreſtrial Animals, even as in Birds, is continual, regular, and periodical: And in the others, as in the *Tortoiſe*, *Camelion* &c. it is interrupted, and ſo ſeldom and unequal, that the *Camelion* is ſomtimes half a day without ones being able to diſcern in him any Motion for the Reſpiration: And ſomtimes it is perceived to ſwell on a ſudden, and to remain a quarter of an hour in this condition. The *Tortoiſe* does probably uſe the ſame] manner. We have a long time obſerved ſeveral living and entire, and we have taken notice that indeed they ſomtimes caſt forth a cold Breath thro the Noſtrils, but it is by intervals, and without order. In thoſe which were opened alive, we ſaw that the Lungs remained continually ſwelled by the exact compreſſion of the *Glottis*, and that it ſhrunk entirely and ſuddenly, when entrance was given to the Air by cutting the *Aſpera Arteria*.

When the Breaſt of a living Dog is opened, by taking away the *Sternum* with the Cartilaginous Appendices of the Ribbs, the Lungs are obſerved ſuddenly to ſink, and afterwards the Circulation of the Blood and Motion of the Heart to ceaſe in a little time, after that the right *Ventricle* of the Heart, and its Auricle with the *Vena Cava* are ſwelled, as if they were ready to burſt: So that to prevent the Animals Death, the end of a pair of Bellows is put into the *Aſpera Arteria*, and puſhing in the Air to make the Lungs ſwell, and afterwards withdrawing them to make them ſink, they are Artificially made to have the Motion that they Naturally uſe: and it is obſerved that the *Ventricle* and right Auricle of the Heart with the *Vena Cava* do unſwell, and the Heart reſumes its ordinary Motion again.

This hapnes not to the *Tortoiſe* in which one has laid open the Lungs; for whether they continue ſwelled, or whether they do ſhrink, the Circulation and Motion of the Heart do continue ſo well in their Natural manner, that it was experimented that a *Tortoiſe* has lived above four days in this Condition. We have alſo made another Experiment to know more diſtinctly the Neceſſity of the Motion of the Lungs, for the entire Circulation of the Blood in Animals whoſe Lungs are abſolutely Fleſhy, and which are not *Amphibious*. An Injection being made by the right *Ventricle* of the Heart into the Artery of the Lungs of a dead *Dog*; it happens that if one continues to make the Lungs riſe and ſink by the means of Bellows put into the *Aſpera Arteria*, the Liquor which is puſhed into the Lungs does eaſily paſs, and go thro' the Vein into the left *Ventricle*: And that when one ceaſes to blow, it paſſes not but with a great deal of difficulty.

After having veiwed the different Structure of the *Ventricles*, and Veſſels of the Heart of the *Dog* and *Tortoiſe*, it is eaſy to give ſome probable Reaſons of the *Phænomena* of theſe Experiments: for it may be ſaid that the Lungs of the *Dog* being ſunk after Expiration, the Veſſels are compreſſed after ſuch a manner, that the Blood cannot paſs; and that it is neceſſary that theſe Veſſels are dilated by Inſpiration for the receiving the Blood of the right *Ventricle* of the Heart; and that they be afterwards compreſſed in the Expiration to preſs it out, and make it paſs into the left *Ventricle*. It may be again Imagined that the *Ventricles* of the Heart of the *Tortoiſe*, and other Animals whoſe Lungs are abſolutely Membranous, not having their walls ſolid like thoſe of the Heart of the *Dogg*, (wherin the Blood has no freer paſſage from one *Ventricle* to the other, but croſs the Lungs) but that being Porous in all their Subſtance, and alſo open one into the other by very large holes, it muſt not be thought ſtrange, that altho the Lungs remain Immoveable, whether blown up, or ſunk, the Circulation is not hindred, and that in theſe Animals it is always performed after the ſame manner as it is in the *Foetus*: Becauſe that in the *Foetus*, as in theſe Animals, the Lungs receive the Blood only for their Nouriſhment, and not for the intire Circulation, ſo that it ſends to the Heart only the remainder of what it has not conſumed: And in fine as the intire Circulation is not performed but by the *Anaſtomoſes* of the Heart in the *Foetus*; it is done alſo in the other Animals which we treat of, only by particular Apertures which the *Ventricles* of their Heart have one into the other.

But to be more aſſured that the Blood Circulates not intirely thro' the Lungs in the *Tortoiſe*, the Trunck of the Artery of the Lungs was tyed up: and it was obſerved that the Motion of the Heart was in no manner altered, and that the Circulation was continued always after the ſame manner. Now this is eaſier to be ſeen in this Animal than in others, by reaſon that its Heart being whitiſh, and the Walls of the *Ventricles* thin before, the Blood was in ſome ſort ſeen to enter in and go out of the right *Ventricle*, from which the *Aorta* proceeds, as has been declared; and this was known by a redneſs which happens when the point of the Heart approaches its *Baſis*, and which diſappears when it is remote from it. For it is eaſy to judg that when the point approaches the *Baſis*, 'tis then that the Heart utter'd the Blood from its *Ventricles*, becauſe that at this very inſtant their Walls preſing inwards, and compreſſing the Blood did cauſe a redneſs to appear in this place. The Compreſſion being capable of making the Bodys, which their Spongious conſiſtence has rendered Opake to become diaphanous by the diminution of the Intervals, which make them Spongious: In fine, this Circulation thus apparent, & which has continued for four Dayes, the Lungs being opned and cut in ſeveral places, has ſeem'd to us very clearly to Demonſtrate that in the *Tortoiſe* the Lungs ſerve not for the Circulation of the Blood, as in the Animals which have fleſhy Lungs.

The true uſe of the Lungs in the *Tortoiſe* and other Animals of its *Genus*, is a thing which has ſeemed to us obſcure enough to excite us to examine it carefully, and to allow us the boldneſs of promoting thoughts ſomewhat extraordinary, following the liberty that we thought we might take to our ſelves in theſe *Memoires*, where we do not place things as being compleated, but only as materials which may be employed or rejected, according as they ſhall be found fitt, or uſeleſs or defective, when time by new Experiments or better Argumentations ſhall better make known their Worth.

We do believe then that there is no appearance that the Lungs of the *Tortoiſe* ſerve for the intire Circulation of the Blood, for the Reaſons which have been alledged: neither is it made for the Voice, the *Tortoiſe* being abſolutely Mute. And it is not conducing to the refreſhment of the Internal Parts, nor for the Evacuation of their Vapours, ſeeing that it wants the continual and regulated Motion which is obſerved in other Animals, and which is neceſſary for theſe purpoſes. So that there remains only the compreſſion of the Internal Parts, whoſe uſes have been explained in the Deſcriptions that we have made of Birds; and which are reduced to the preparation and diſtribution of the Nouriſhment: But we do ſearch after another uſe more Important, and which being more particular to the *Tortoiſe* and the other Animals of its *Species*, does better anſwer to the particular Conformation of their Lungs; and we have found that to this part may be attributed the faculty that the *Tortoiſe* has of raiſing, and holding it ſelf above the Water, and of ſinking to the bottom when it pleaſes, in ſo much that it ſupplys the place of the Air-Bladder, which is found in moſt *Fiſhes*.

There are ſeveral conjectures on which we found the probability of this Opinion, and which do make us to think that this Bladder of *Fiſhes*, and the Lungs of the *Tortoiſe* being enlarged, do render the Body of theſe Animals light enough to Swim upon the Water; and that when theſe parts are contracted, and the Air which is capable of compreſſion, taking up leſs room by reaſon it is ſtraitned, and ſo the whole Body being leſs extended, it deſcends to the bottom, after the ſame manner as the little hollow Figures of Enamel encloſed in a Pipe of Glaſs, do ſink to the bottom when by preſſing on the ſurface of the Water, the Air is compreſſed which is encloſed in the Cavity that makes them Swim.

We have frequently obſerved that as ſoon as a *Tortoiſe* is put into the Water, it caſts forth thro' the Mouth or Noſtrils, ſeveral bubbles, which are in all likelyhood formed by the overmuch Air that it has in its Lungs, for the keeping it ſelf in a juſt *Equilibrium*; which puts it in a condition of being heavy enough to ſink to the bottom, at the leaſt compreſſion which its Muſcles do make upon its Lungs, juſt as the little Figure of Enamel deſcends in the

Water,at the ſmalleſt effort that is made to compreſs the Air that it encloſes; and it is eaſy to comprehend that if the *Tortoiſe* being at the bottom of the Water, relaxes the Muſcles that did compreſs its Lungs, the Air by the Virtue of its Spring returning into its firſt State, can give again to its whole Body, the extent which it had when it did Swim upon the Water.

The probability of this Arguing has been confirmed by Experience. A living *Tortoiſe* was lockt up in a Veſſel full of Water, on which there was with Wax exactly faſtned a cover, from the top of which there went a Glaſs Pipe. The Veſſel being full ſo as to make the Water appear at the bottom of the Glaſs pipe,we obſerved the Water did ſomtimes aſcend into the Pipe,and that ſomtimes it deſcended.Now this could be done only by the augmentation and dimunition of the Bulk of the *Tortoiſe*;and it is probable that when the *Tortoiſe* endeavoured to ſink to the bottom, the Water fell in the Pipe, becauſe that the Animal leſſened its Bulk by the contraction of its Muſcles; and that the Water roſe by the ſlackning of the Muſcles, which ceaſing to compreſs the Lungs, did permit it to return to its firſt ſize, and did render the whole Body of the *Tortoiſe* lighter.

The exactneſs with which the *Glottis* is cloſed in this Animal, ſeems greatly to aſſiſt the effect of this compreſſion; even as it is credible that it is for ſuch an uſe that the Bladders of Fiſhes are ſo cloſed, that what force ſoever be uſed for the Compreſſing them, the Air cannot be got out otherwiſe than by burſting them: For there is no likelyhood that theſe Bladders are in Fiſhes to remain always in one State: They would hurt them as much in hindering them from deſcending in the Water, as they would aſſiſt them by making them to riſe towards its Surface, and for this purpoſe it would have ſufficed that their body was of a Subſtance thin enough to render their bulk proportioned to their weight, ſuch as is the Subſtance of Wood and other Spongious Bodys which do Swim upon the Water. We have for a long time obſerved *Tortoiſes* floating upon the Water without ſtirring. Fiſhes do likewiſe keep themſelves a long while in one place under Water, ſomtimes near the bottom of the Water, ſomtimes near its Surface. The little Figures of Enamel do thus ſtop themſelves in different places according to the different Compreſſions that are made in the Air which they do contain.

Ariſtotle and *Pliny* have remarkt that when *Tortoiſes* have been a long time upon the Water during a Calm, it happens that their ſhell being dryed in the Sun, they are eaſily taken by the Fiſhermen, by reaſon that they cannot plung into the Water nimbly enough, being become too light. This ſhews what equality there ought to be in their *Equilibrium*, ſeeing that ſo little a change as this; which may happen by the ſole drying of the Shell, is capable of making it uſeleſs. For it is probable that the *Tortoiſe*, which is always careful to keep it ſelf in this *Equilibrium*, ſo as other Animals are to keep themſelves on their Leggs, in this caſe, by the ſame inſtinct, dares not let the Air out of its Lungs,to acquire a weight which might make it ſpeedily to ſink; becauſe it fears that its Shell being wett, it ſhould become ſo heavy, that it being ſunk to the bottom of the Water it might never have power afterwards to re-aſcend.

Now the Obſervation of the unmoveableneſs of the Lungs, does very well agree with the want of the Organs, which might ſerve for its Motion; for the *Tortoiſe* has not only its Shell, which ſupplys the place of the *Sternum*, abſolutely immoveable, but in it we have found neither *Diaphragme*, nor other parts which might ſupply this Motion. The Bone of the Arm called *Humerus*, which it has encloſed in the Breaſt, has a very long *Apophyſis* at the place of the Articulation of the *Cubitus*, which is joyned with an other Bone articulated to the *Cubitus*: So that theſe Bones do joyntly form two productions on each ſide, which approaching forward, are like *Claviculæ*: But theſe parts are immoveable, and do evidently ſerve only for a *Baſis* or Origine to the Muſcles which do ſupply the place of Pectorals; and which draw forward the moveable part of the Arm, *viz.* the *Cubitus*, *Radius*, and Hand. There were found Muſcles enough that might ſerve for the Compreſſion of the Lungs; but Muſcles alone are not proper to its dilatation; there muſt be the Ribbs and a *Sternum*, or ſomthing *Analogus* that may be moveable. So that it is apparently neceſſary to ſuppoſe that the Inſpiration is made by the Spring of the hard and firm Ligaments which compoſe the Maſhes that have been deſcribed: Inſomuch that when the Muſcles which may compreſs the Lungs begin to ſlacken, theſe Ligaments are extended, and enlarging the Apertures of all the Bladders, do encreaſe the capacity of the whole Lungs. Altho' our *Tortoiſe* was not of thoſe that live in the Water, it did not fail, in regard to this particular formation of the Heart and Lungs, to have it like that of the Animals of its *Species*, as ſeveral Birds are obſerved to have Wings tho' they do not fly.

The *Brain* was very ſmall: For the ſize of the Head, which, in proportion to the reſt of the Body, is very ſmall, conſiſted principally in the Bones of the *Cranium*, and in the Fleſh of the *Crotaphitæ* Muſcles that covered it, and which were thick as in the *Lyon*: The Bone of the Crown of the Head having a creſt after the manner of all Animals that have an extraordinary ſtrength in the Jaws. The *Cerebrum* with the *Cerebellum* were in all ſixteen Lines long and nine Lines broad. The *Sea-Tortoiſes* which are taken at the *Ant-iles* have it three times leſſer in proportion: For, according to the Relations which we have of thoſe Countries, the *Tortoiſes* which have there a Head as bigg as that of a *Calf*, have the Brain no bigger than a Bean.

The Membranes of theſe two parts, their Subſtance, the *Lacis Choroides*, the *Glandula Pinealis*, the *Pituitarius*, the *Infundibulum*, and generality of the Nerves were after the ſame manner as they are ſeen in Birds: The other parts had ſomthing particular. The *Olfactory* Nerves were of an extraordinary grandure, making near the fourth part of the whole Brain. The *Optick Nerves* took their Origine from the *Olfactory*. The two *Tuberoſities* that the *Cerebellum* has in Birds, inſtead of being faſtned to the lateral parts of the *Medulla Spinalis*, were in its upper part. The *Cerebellum* was neither furrowed by parralel Lines on the out ſide, nor diverſified on the inſide by the different Colours of its Subſtance, which repreſent the Branches of Trees, and its Cavity was advanced very farr into the *Medulla Spinalis*, going even to the firſt *Vertebra* of the Neck.

The *Medulla Spinalis* was covered with its vſual Membranes and moiſtned by ſeveral Veſſels which did accompany it to its End; It filled the whole Cavity of the *Vertebræ* and ſent from one part and the other ſeveral pair of Nerves; Thoſe which were diſtributed to the Arms, leggs, Neck, and Tail, were very large and Numerous.

The

The *Globe* of the *Eye* was an Inch Diameter. The Internal Eye-lidd which we have ſeen ſtirr in living Tortoiſes, had the ſame Muſcles which we have obſerved in Birds. The *Cornea* was very thinn. The Aqueous Humour had a Conſiſtence ſo thick, that it did hardly run: The *Iris* was of a light-ſoot-Colour; There were ſeen ſeveral Veſſells interlaced. In the little *Tortoiſes* that we have here, which are all water *Tortoiſes*, the *Iris* had four yellow rayes on a ground of light ſoot-Colour. Theſe rayes were diſpoſed in Croſſes round the hole of the *Uvea*. The *Chryſtallinus* contain'd but one line Diameter. It was flat and lenticular. The Membrane made like a black purſe which is found in the Eyes of Birds, was not met with in our Subject. The *Tongue*, whoſe Figure was Pyramidal, had an Inch in length and four lines in Bredth. It was thinn, not exceeding a line, the fleſhy ſubſtance of which made but the half. The *Tunicle* had over it a great number of little Teats. The Tongue with the *Os Hyoides* had Ten Muſcles, five on each ſide. The firſt, which drew the *Os Hyoides* forward, went from the *Symphyſis* of the lower Jaw to the Baſis of the *Os Hyoides*: The ſecond, which drew it ſide ways, went from the Interiour part of the *Omoplata* to the Baſis of the *Hyoides*: The third which drew it upwards, went from one of its Hornes to its Baſis. The fourth which drew the Tongue forward, went from the *Symphyſis* of the Chin to the ſide of the Tongue. The Fifth, which drew the Tongue ſideways and towards the Baſis, went from one of the Hornes of the *Os Hyoides* to the Baſis of the Tongue.

The Neceſſity that there was of keeping the Remains of this rare and extraordinary ſubject, for an Ornament of the *Aviary* of *Verſailles*, haveing hinder'd us from perſuing any farther the Enquiry of the Organs of ſenſe in the Head of our *Tortoiſe*, we have ſupplied this defect by the diſſection of ſeveral other *Tortoiſes*, where we have obſerved that the Olfactory Nerves terminated at a delicate Membrane of a black-Colour, which covers the Inſide of the noſtrills; This Membrane had neither folds nor Ridges that did enter into the holes of the *Os Ethmoides*: In the Anteriour part of the palate, there was two holes which opened into the Noſtrills.

As to the *Ears*, in our ſmall *Tortoiſes* as well as the great, there was no External Aperture, the Bone did appear only ſunk at the right ſide of the Temples; And the skin covering this Sinking was thinner and more delicate than elſewhere, and ſeemed alſo ſome what ſunk in this place. After having taken away this skin, there was diſcovered a round hole of the bigneſs and forme of that of the hole of the Eye. It was cloſed by a kind of *Cartilaginous* thin plate very moveable, being faſtned all about to the edge of the round hole by a very thin Membrane. At the ſide of the hole towards the hinder part of the head, there was a *Cartilaginous Ductus*, which deſcended into the palat, where it had a long Aperture making a little cleft. Under the *Cartilaginous* plate there was found a great Cavity of an Oval figure, very long, containing twice its breadth. This Cavity was pierced at the ſide, to give paſſage to a little *Stiletto* very ſmall, which came obliquely to ſuſtain the *Platina* by one End, and by the other, having paſſed thro a ſecond Cavity, which was a little beneath and beſide the great one, it ſtopped a hole by which the ſecond Cavity was opened into a third, which was Anfractuous, and which received the Auditory Nerve; The End of the ſtyletto which cloſed the Aperture of this third Cavitie went enlarging it ſelf like the end of a Trumpet, and had a delicate membrane which faſtned it to the Circumference of the hole.

Thoſe who have made the Deſcription of the *Ant-Iſles*, which of all in the world has the greateſt quantity of *Tortoiſes*, do ſay that they are deaf. We have reaſon to doubt, conſidering the Organs that we have juſt deſcribed, whether theſe Hiſtorians may have uſed all the care neceſſary for the being well inſtructed in this Particular, it being probable that they contented themſelves with the conjecture which may be drawn thereupon from the defect of the Aperture which theſe Animals have in their Ears: Unleſs the Ears ſhould be in *Tortoiſes* the ſame as the Eyes are in *Moles*; that is to ſay they ſhould have Ears without Hearing, as the *Moles* have Eyes with which they do not See.

The Obſervation which we have made upon the *Tortoiſe's* ſtirring its Neck to turn it ſelf when it is on its back, has given us an opportunity of ſearching out the Muſcles which do bend and extend this part. We have firſt found that this Neck has two kinds of Motion, which are each compoſed of flexion and extention. The firſt Motion is that by which the *Tortoiſe* draws its Neck and Head inwards, or extends it, and makes it to go outwards. The ſecond is that by which the Neck being thruſt out and extended, is turned on all Sides. In the firſt kind of motion the Neck is extended when the Muſcles which ſerve for the different flexions of the Neck do act together and with an Equal force; And it is drawn in with the head by two different flexions and Extentions of the *Vertebræ*, one of which is at Top and the other at bottom: which gives to the Neck a figure like to that which the Neck of a *Swan* takes when this bird draws its head towards its back. For this reaſon, beſides the Muſcles which do turn the Neck every way when thruſt forth, and which are common to all the motions of the Neck, there are five particular ones on each ſide which ſpringing from the *Apophyſis lumbaris* and from the laſt ribbs, do aſcend a long the *Vertebræ* of the back, and are inſerted in five different places of the oblique *Apophyſis* of the *Vertebræ* of the Neck, the longeſt being faſtned near the Head to the body of the firſt *Vertebra*. The Muſcles which, when they act ſeparately do ſerve for the flexions of the Neck thruſt outward, do ſpring from the *Vertebræ* of the Neck, and are likewiſe inſerted to its *Vertebræ*. Some taking their Original at the body of a *Vertebra*, are inſerted to the *Apophyſes* of others: Others proceeding from the *Apophyſes* are joyned to other *Apophyſes*; Inſomuch that when the Muſcles of one ſide do act Separately, the flexion is made on that very ſide; and when they do act joyntly with an Equall force, the Extenſion of the whole Neck Enſues, as has been ſaid.

When the Head is drawn inward, it ſinks into a fold of the Skin which is upon the ſhoulders, which formes as it were a Hood. This is done by the means of a very large and thick Muſcle adhering to the Skin, and which being faſtned to the *Spinal Apophyſes* of the *Vertebræ*, from whence it ſeems to riſe, is folded underneath, covering and enveloping the *Aſpera Arteria* and the *Oſophagus*. The Different ſituations of the *Fibres* of this Muſcle, which may make it to paſſe for an union of ſeveral Muſcles, do produce the divers folds of this Skin made in form of a Hood, when they do act differently.

FINIS.

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FINIS.

THE PUBLISHER To The READER

T*Heſe Famous* Memoir's *containing the Anatomical Deſcriptions of ſeveral Animals (and thoſe all* Exotic *and ſcarce to be procured) together with very excellent Obſervations thereon, are ſome of the firſt-fruits and accurate performances of the Royal Academy of Sciences at* Paris. *They were by them ſome time ſince ſo Magnificently, as well as Curiouſly ſet forth in two Volumes, that (as they ſeemed not to be deſigned for common Sale, ſo) they became Preſents only from the King, or Academy, to Perſons of the greateſt Quality, and were hereby rendered unattainable by the ordinary Methods for other Books. And altho' by ſome few, who (through this means) had the opportunity of peruſing them, they were found full fraught with very Pertinent, as well as Curious Obſervations; yet ſo great was the difficulty in procuring the favour of ſuch a peruſal (not only here in* England, *but even at* Paris *it ſelf) that the Ingenious* Labours *of that Illuſtrious Society were hereby made leſs Vſeful and Ineffectual to their great Deſign; moſt of the* Learned *being totally deprived of the ſingular Advantages that might be obtained therefrom.*

For theſe Reaſons it was judged that the exhibiting of this admirable Treatiſe in an Engliſh *dreſs, might prove no unacceptable Preſent, it being a Work inriched with many Curious Phyſical, and no leſs Vſeful Anatomical Remarks, of great Importance to the Promotion and Improvement of* Natural *Knowledg; eſpecially that part which reſpects the Conſtruction, Fabrick, and Genuine Vſe of the Parts of Animals, and even of Man: A Knowledge no way better to be obtained than from the Comparative Anatomy of divers Animals; that Texture of Parts being diſcoverable in one Animal, which* Nature *has conceal'd and made more obſcure in another.*

Theſe Conſiderations, backt with the earneſt Importunities of ſeveral Friends, and the hopes of being ſerviceable to the Ingenious Inquirers into Nature, ſo far prevailed upon me, that (in compliance to their deſires, and *for the publick Benefit) I undertook this* Edition, *wherein I have uſed my utmoſt endeavours for the rendering a faithful Tranſlation thereof; ſtill keeping as near as I could to the true ſenſe of the* French *Coppy, and varying as little therefrom as the Nature of the* Engliſh *Language would permit. How far they have herein ſucceeded, is wholly ſubmitted to the Cenſure of the* Learned, *whoſe kind acceptance of theſe performances may prove a farther Motive to preſent them with ſome other things of this kind, whereby the uſeful Application of theſe, and divers others of the like Nature will more evidently appear.*

But there was one thing more difficult to be overcome (at leaſt by me) than what I have hitherto mentioned, and that was the preſenting you with the Figures and Delineations, which in the French *Edition are exceedingly accurate, as well as skillfully Engraven in Copper. And herein Gratitude oblidges me to acknowledg the great kindneſs of Mr.* Richard Waller, *without whoſe Aſſiſtance I ſhould have been at a loſs, and this Deſign would have fall'n to the Ground: But his Zealous endeavours to promote Natural Diſcoveries ſoon prevail'd with him to ingage himſelf in this more difficult Task: And accordingly he proportioned and wrought them after the* French *Originals, with as much exactneſs as was poſſible; and altho' to accommodate them to this Volume, he was neceſſitated to contract and leſſen the ſize, yet has he ſo well diſpoſed of the Parts of each Plate, that what is moſt material is very plain and clearly Intelligible. Moſt of the Animals are repreſented three quarters as bigg as in the Originals, and all the Diſſected Parts half as bigg; excepting ſome few as bigg as the* Life, *which is expreſſed in their particular Explications.* His *great Care in thus nicely contracting the Plates, and allowing to each part its due Symmetry and Proportion are ſufficient Teſtimonies of his Skill in Deſigning, which with his other Abilities being already well known to the* Royal Society, *I muſt (by reaſon of his Modeſty and my near Relation) forbear giving him thoſe Prayſes which in Juſtice belong unto him.*

To him alſo I am oblidged for furniſhing me with the Tranſlation of the Obſervations made for Meaſuring a Degree upon the Earth, *which tho' it be a Subject of a differing Nature, yet being one of the moſt conſiderable Productions of the ſame Illuſtrious Academy, and being joyned to one of the Volumes in the* French *Edition, I conceived it would be as pertinent and proper to accompany them in* Engliſh.

Thus have I given you a ſhort account of this following undertaking, hoping you may hereby receive as great Satisfaction in peruſeing, as I have done in tranlateing theſe Memoir's.

ME-

THE MEASURE OF THE EARTH.

ARTICLE I.

THE attempt to determine the Magnitude of the Earth is not new. Many ancient Authors have made themſelves famous by this enquiry. But the moſt memorable Attempt for this purpoſe was that of the *Arabians*, thus Recorded by their Geographer. A great Circle on the Earth is divided into 360 parts, as we alſo ſuppoſe thoſe in the Heavens. *Ptolomy* Author of the *Almageſt*, and many other of the Ancients have obſerved what ſpace upon the Earth contains one of theſe 360 Parts or Degrees, and have found it to contain $66\frac{2}{3}$ Miles. Thoſe which ſucceeded them, willing to ſatisfie themſelves by their own experience, met by the order of *Almamon* in the Plains of *Sanjar*, and having taken the height of the Pole, they divided into two Troops, the one marching as directly as was poſſible towards the North, and the other towards the South, till the one found the Pole one Degree more, and the other one Degree leſs elevated; then meeting again at their firſt ſtation to compare their Obſervations, they found the one had computed $56\frac{2}{3}$ Miles, but the other juſt 56. but they agreed to account $56\frac{2}{3}$ for one Degree, ſo that between the Obſervations of the Ancients, and of theſe Moderns there is a difference of 10 Miles.

Abulfeda in his Preface.

Now *Ptolomy* having eſtabliſh'd the bigneſs of a Degree 500 Stadia, for which the *Arabs* account $66\frac{2}{3}$ Miles, it follows that the Arabian Mile was equal to $7\frac{1}{2}$ Stadia; but we are to ſeek what Stadium *Ptolomy* means; for if it were the Greek, eight of which made one ancient Italian Mile, the proportion of the Arabick Mile, ſo the Italian will be as 15 to 16, and conſequently the $56\frac{2}{3}$ Miles found in a Degree by the *Arabs*, will make but $53\frac{1}{8}$ old Italian Miles. But if more favourably to the *Arabs*, we ſuppoſe (which is moſt likely) that the 500 Stadia of *Ptolomy* were the Alexandrian, bigger than the Grecian, according to the proportion commonly received of 144 to 125, we ſhall find that the Degree meaſured by the *Arabs* was 61½ Italian Miles, which makes 47188 Toyſes of *Paris*, ſuppoſing that the old Roman Foot (the ſame which Father *Ricciolus* after *Vilalpandus* would have eſtabliſhed it) was to that of *Paris* as 667 to 720. though the Roman Foot, of which the Module is to be ſeen in the Capitol, is to the ſame Pariſian Foot, but as 653 to 720. or thereabouts.

'Tis very remarkable that anciently the meaſure of the Earth was always upon the diminiſhing. For if we will believe *Ariſtotle*, or the moſt part of the *Mathematicians* of his time, according to his report, a Degree was about 1111 Stadia, whereas *Eratoſthenes* counted but 700. *Poſſidonius* 666, and in fine *Ptolomy* 500. In like manner the *Arabs* following the ſame example make a Degree leſs than all that preceded them. But without entering upon the determination, whether theſe Opinions are ſo different as they appear, it may ſuffice in brief to ſay that we are ignorant of the juſt quantities of the ancient Meaſures, all the Meaſures that the Ancients have left us being altered by time.

Amongſt the Moderns, *Fernelius* and *Snellius* are the chief, who not contenting themſelves with uncertain Traditions, were willing to leave us their particular Obſervations for the bigneſs of a Degree.

Fernelius at the beginning of his *Coſmotheoria* ſays, that leaving *Paris* he went directly North, until by the Meridian Altitudes of the Sun he found the heighth of the *Pole* one whole Degree more than at *Paris*. But whether becauſe he would imitate the *Arabs*, or for ſome other Reaſon he has concealed the name of the place where he ſtaged, ſaying only that it was at 25 Leagues from *Paris*, and that for knowing this diſtance more preciſely he went in a Coach, and counted all the turns of the Wheel till he arrived at *Paris*. And in fine, having eſtimated how much the irregularities and turnings of the way might augment the length, he judged that a Degree of a great Circle of the Earth contained 68096 Geometrical Paces, which according to our way of meaſure are equal to 56746 Toyſes and four Feet of *Paris*.

Snellius took a more certain way, and ſomewhat like what will be found practiced in the following account; for inſtead of relating his eſtimation, he ſearched by Geometrical ways the Meridional Diſtances between the parallels of *Almain*, *Leyden*, and *Bergopſon*, then according to the differences of the heights of the Pole in thoſe Places, he concluded a Degree was 28500 Rhinland Perches, which make 55021 Toyſes of *Paris*.

This laſt Meaſure was commonly followed as the moſt exact. But Father *Riccioli* by a method which we ſhall anon examine, hath (ſince highly priſed above other) made the Degree 64363 Paces of *Bologna*, or about 62900 of our Toyſes.

In this diverſity of Opinions 'twas worth while to try the whole anew for the ſolution of this famous Problem, not only for the uſe of Geography in what concerns the difference of Longitudes, but more particularly for the uſe of Navigation. And that ſo much the rather, for that to this time not a Perſon has underſtood the prevalency of the great advantage that may be made of Teleſcopes from the executing of this Deſign, and for that by other means it is eaſie to eſtabliſh a meaſure which cannot change.

ARTICLE II.

THE Earth and Water make but the ſame one Globe which compriſes both the one and the other under the name of the Earth. We ſhall not ſtay to ſhew the proofs here, but this truth being ſuppoſed for conſtant, 'tis demanded what is the bigneſs of the Globe of the Earth; and ſince it would be impoſſible to meaſure the compaſs intire, 'tis reduced to the meaſure of one part, from whence the bigneſs of the whole may be concluded; which reduction is ordinarily to the quantity of one Degree.

For ſince the roundneſs of the Earth is a little varied by the inequality of the Mountains, like that of a very fine Orange by the grain of its Peel; theſe inequalities are ſo conſiderable to our purpoſe, and ſo great in compariſon of common meaſures, that for the obtaining of the knowledge of a conſiderable diſtance, though leſs than that of a Degree, 'tis neceſſary to have recourſe to Geometry, to make uſe of a Chain or ſucceſſion of Triangles united together, the ſides of which are as ſo many great meaſures, which paſſing over the inequalities of the ſurface of the Earth, give us the meaſure of a Diſtance, which it would be impoſſible to meaſure otherwiſe.

For the well forming of theſe Triangles 'twas neceſſary to point at far diſtant Objects with ſuch preciſeneſs, as not only to be ſure of directing at the whole Object, but even at a certain point thereof. There has been invented for this divers ſorts of ſights, but all imperfect and incapable of giving the preciſeneſs requiſite. 'Twas on this account *Snellius* willing to excuſe the errour of ſome minutes which he found in his Triangles, had reaſon to blame his ſights, through which (as he ſays himſelf) an Object of the bigneſs of ſome minutes appeared but as a point, and even ſo with difficulty. But for ſome Years it has been thought adviſeable to put Teleſcopes in the place of the old way of Sights, which has been ſo happily performed that there ſeems to be nothing more to be deſired for this purpoſe, as will appear by the ſequel.

Eratoſth. Batavus, pag. 169.

ARTICLE III.

IN the deſign which was propoſed for performing the menſuration of the Earth, it was judged that the ſpace contained between *Sourdon* in *Piccardie*, and *Malvoiſine* in the Confines of the *Gaſtinois*, and of the *Hurepois*, would be very proper for the execution of this deſign, becauſe theſe two bounds which are diſtant one from the other about 32 Leagues, are ſcituated very near in the ſame Meridran; and 'twas known by divers Journeys purpoſely made, that they might be joyned by Triangles, with the high-way from *Villejuive* to *Juviſy*; which way being paved in a ſtrait line, without any conſiderable inequality, and of ſuch a length (as will appear hereafter) was proper to ſerve for the fundamental Baſe of all the Meaſure that was undertaken.

For actually meaſuring the length of this way, four Pike Staves, each of two Toyſes were made choice of, which being joyned two and two at the great ends by a Screw, made two Meaſures each of the length of four Toyſes.

The manner obſerved in the meaſuring was, that after one of the Meaſures was placed on the Earth, the other was joyned to it end to end, along by a great Rope, then the firſt was taken up, and ſo ſucceſſively. And for the more eaſy keeping the account, the Meaſurer who laid the ſecond Rod had ten little ſtakes given him, one of which he left ſtanding at the head of his Rod every time he laid it on the ground; ſo that every ſuch ſtake noted eight Toyſes; and when all the ten were taken up, they marked eighty Toyſes.

In this manner the diſtance between the middle of the Mill of *Villejuive* all along the great or high way to the Pavillion of *Juviſy* was twice meaſured, which diſtance was found to be 5662 Toyſes and four Foot in going, and 5663 and one Foot in returning. But as a nearer approach to exactneſs could not be hoped, ſo the difference was divided, and the round number of 5663 Toyſes was agreed on for the length of the line, or fundamental Baſe upon the which we have built all the Calculations hereafter, ſave only that at the concluſion of our work we veriſy'd the whole by a ſecond Baſe of 3902 Toyſes actually meaſured as the former. In which without doubt we had very much the advantage of all thoſe that have preceded us. For *Snellius* having begun by a diſtance meaſured of 326 Verges and 4 Foot of the Rhein Meaſure, which make 630 of our Toyſes; It was afterward regulated by one which was not above 87 Rhein Verges, or 168 Toyſes. And Father *Ricciolus* framed all his Meaſure upon a Baſe of 1088 Bologna Paces, or about 1064 Toyſes of *Paris*.

ARTICLE IV.

THE Toyſe of which we ſpeak, and which we have choſen as the moſt certain Meaſure, and moſt uſed in *France*, is that of the Grand Chaſtelet of *Paris*, according to the original which has been lately re-eſtabliſh'd. It is of ſix Foot, the Foot contains twelve Inches, and the Inch twelve Lines; but to prevent, that what has happen'd to all ancient Meaſures (of which nought but the names remain) might not happen to ours; we have adapted it to an Original taken from Nature it ſelf, which ought therefore to be invariable and univerſal. To that effect the length of a ſingle Pendulum was by two great Pendulum Clocks exactly determined, each of whoſe ſingle vibrations or free agitations was one ſecond of time conformable to the mean motion of the Sun, which length was found to be 36 Inches, 8 Lines and a half, according to the *aforeſaid* meaſure of the Chaſtelet of *Paris*.

'Tis commonly known, that to make a ſimple Pendulum, a little ball about the bigneſs of a Muſquet Bullet, is ſuſpended by a very flexible thread, and the length of this Pendulum muſt be meaſured from the top of the thread to the center of the Ball, ſuppoſing the Diameter of the Ball not much to exceed the 36*th* part of the length of the thread, otherwiſe there muſt be an account had of a proportional part which We have here neglected; and care muſt alſo be taken that the vibrations be ſhort, for if they be beyond a certain Degree, they are of unequal duration one to another.

The Ball of our Pendulum was of Copper of an inch in Diameter, and it was turned. The thread with which the firſt experiments were made was of flat or raw ſilk. But becauſe that ſtretches ſenſibly by the leaſt humidity of the air, it was found that 'twas better to uſe a ſingle filament of a ſort of long Flax called *Pite*, which is brought out of *America*. The upper end of the thread was put between a ſmall Vice with a ſquare head, which held it faſt ſcrewed moſt exactly; by this means the motion of the Pendulum was more free, and the length more eaſily meaſured by an Iron Rod exactly fitted between the end of the Vice and the Ball.

The two Clocks made uſe of were of the greater ſort, whoſe Pendulums meaſured whole ſeconds, they were exactly regulated according to the mean motion of the Sun, and went ſlower by 3 Minutes 56 ſeconds at every return of the ſame fixt Star to the Meridian, with ſuch a regularity that ſometimes they differed not one from another by one ſecond during many Days. A ſingle Pendulum was ſet in motion, and made to go and come from the ſame ſide as the Pendulums of the Clock did, and being left in this condition they were inſpected from time to time to ſee how they went. For how little ſoever the length of this ſingle Pendulum either exceeded or wanted of 36 Inches, 8½ Lines, one might perceive ſome diſagreement in leſs than an hour. 'Tis true that this length was not always found ſo preciſe, and that it ſeemed that it ought to have been regularly a little ſhortned in Winter and lengthened in Summer. But that however was but the 10*th* part of a Line) ſo that having a reſpect to this variation, it has been judged beſt to take the mean between them, and to take the length of 36 Inches 8$\frac{1}{2}$ Lines for the certain Meaſure.

If the length of the Pendulum for ſeconds be once found expreſt according to the uſual Meaſure of every place, by this means may be had the proportion of the different Meaſures ſo exact as if the originals had been compared, and this advantage would thence accrue, that for the future any change therein might be diſcovered.

But beſides the particular Meaſures, an agreement might be found of ſuch as follow, which will need no other original but the Heavens.

The length of a Pendulum of a ſecond of the middle time might be called by the name of an Aſtronomical Ray, the third of which ſhall be the univerſal Foot. The double of the Aſtronomical Ray makes the univerſal Toiſe, which will be to that of *Paris* as 881 to 864.

Four times the Aſtronomical Ray may make the univerſal Perch equal to the length of a Pendule of two ſeconds.

Finally the univerſal Mile may contain 1000 Perches.

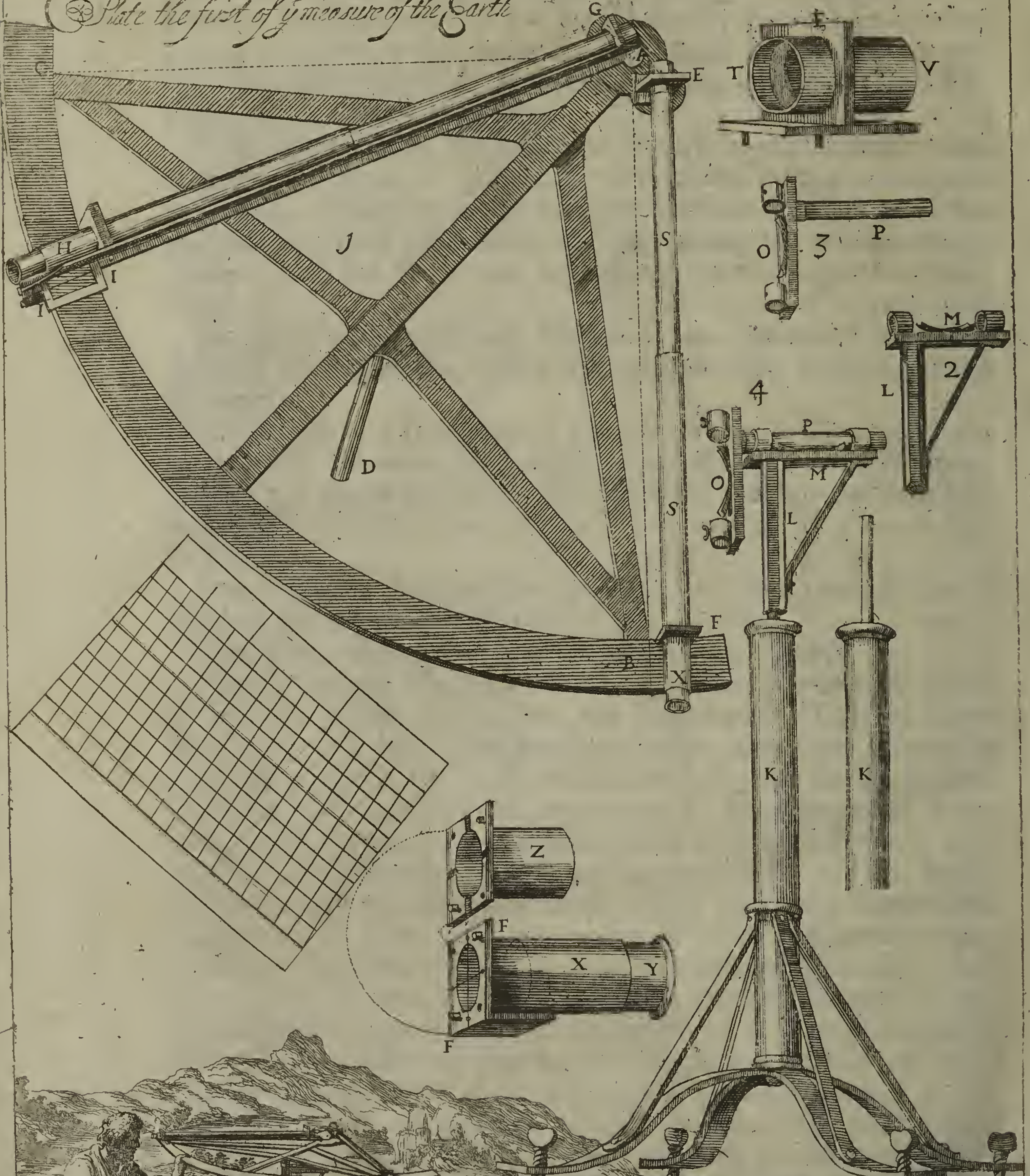
Theſe univerſal Meaſures ſuppoſe that the difference of places cauſeth no ſenſible variation to the Pendulums. 'Tis true, there have been made ſome experiments at *London*, *Lyons* and *Bolognia* in *Italy*, by which it ſeems one might conclude that the Pendulums ought to be ſhorter in ſome proportion as the Æquinoctial is approacht. Conformable to a conjecture which has been formerly propoſed in the Aſſembly, that ſuppoſing the motion of the Earth, weights ought to deſcend with leſs power under the Æquinoctial than under the Poles. But we are not ſufficiently informed of the juſtneſs of theſe Experiments to make any concluſion thence. And we muſt beſides note, that at the *Hague*, where the heighth of the Pole is greater than at *London*, the length of a Pendulum exactly determined by means of Clocks, was found the ſame as at *Paris*. 'Tis for this we adviſe thoſe who would make experiment with a ſingle Pendulum, to make uſe of great Pendulum Clocks, for that otherwiſe they will difficultly meet with the juſt Meaſure. If it ſhould be found by experience that the Pendulum will be of different lengths in different places, the ſuppoſition we have made concerning the univerſal Meaſure drawn from the Pendulums, cannot hold, but this hinders not but that in every place there will be a perpetual and invariable Meaſure.

The length of a Pariſian Toyſe, and that of a Pendulum of ſeconds, ſuch as we have now eſtabliſht, will be carefully preſerved in the Magnificent Obſervatory, which His Majeſty has cauſed to be built for the advancement of Aſtronomy.

AR-

page 7.

Plate the first of ye measure of the Earth



ARTICLE V.

SINCE the Inſtrument we made uſe of for meaſuring the Earth, had ſomewhat ſingular, it will not be inſignificant to deſcribe it before we come to the following Obſervations.

This Inſtrument was a quarter of a Circle of 38 Inches Radius, the body of it is of Iron, and all the pieces are faſtned together underneath by Screws upon the Area of it. The Limb B C and that part about the Center A, are covered with Copper. The Broach or Cilinder D is faſtned perpendicular to the back of the Inſtrument to fix it on its Pedeſtal. E F is a Teleſcope which ſerves inſtead of the immovable ſights, being faſtned at one end to the Plate of the Center A, and at the other end to one of the extremities of the Limb. Plate the firſt.

G H is another Teleſcope carried by an Alidade or arm of Iron which turns upon the Center A, and which may be fixed upon any part of the Limb deſired, according to the Angle to be obſerved.

The Limb B C is exactly divided even into Minutes very diſtinctly, much of the bigneſs and form repreſented in the adjoining Figure.

An Hair ſtretched in the little frame I, or a ſilver Wire ſmaller than a Hair, ſerves for the fiducial Line of the Alidade, by which one may very eaſily diſtinguiſh to the fourth part of a Minute, eſpecially if a Loupe or Glaſs that magnifies the object, be uſed.

But that which we have here principally to deſcribe, is the conſtruction of the Teleſcopes E F and G H, which being in all things alike the one to the other, it will be ſufficient to deſcribe one of them.

S S is a Cylinder of Latton or Tin, made of two pieces running one within the other, that they may be taken off or put on at pleaſure upon the two Pinnules E. F which are fixed.

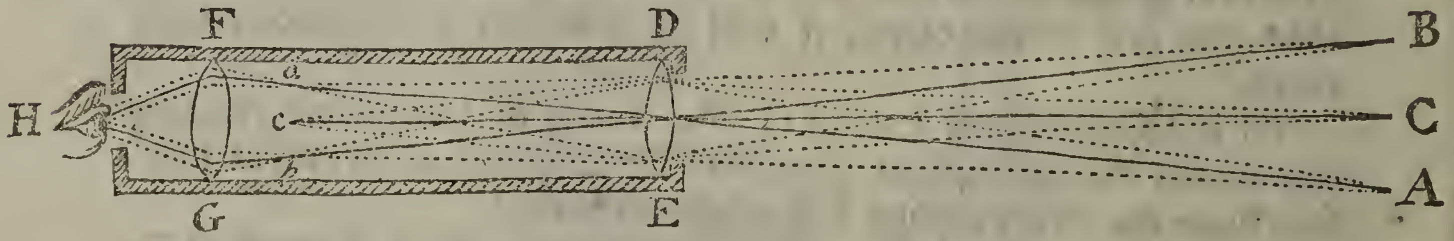
The Object Pinnule E carries in the fore-part of it marked T, an Object Glaſs of a Teleſcope of a length proportioned to the Inſtrument: And by the ſide V it ſuſtains one of the ends of the Cylinder S S.

The eye Pinnule F is of three Pieces, the firſt F X which is faſtned to the Limb of the Inſtrument is a hollow Cylinder about 3 Inches long, ſodered to the middle of the (Chaſſe) or Frame F F, upon the face of which are two ſmall ſingle Clews of black Silk ſtiff ſtrained at right Angles in four ſmall graved ſtrokes, which keeps them from breaking, and they are faſtned by the means of a little melted Wax. The ſecond Z is a little hollow Cylinder ſodered as the former to the middle of a ſquare Piece, which by two Screws is joined to the frame F F, to ſerve as well for the defence of the Filets, as to ſuſtain the great hollow Cylinder S S. The third Y is another little hollow Cylinder which is ſlipped within the firſt X, and which carries the Eye-Glaſs of the Teleſcope.

The fixed diſtance between the two Pinnules E. F ought to be ſuch that the anterior face of the frame F F, where the Filets of the Teleſcope are ſtrained, do meet each other exactly in the focus of the Object Glaſs; and this neceſſity cauſes the Object Glaſſes to be made (for the moſt part) firſt before the Inſtrument is begun. All put together does the effect of a Teleſcope that inverts the Object, which inconvenience may eaſily alſo be rectified, making uſe of more Eye-Glaſſes, and a little uſe will make it inſenſible.

All the peices of ſuch a Teleſcope as is here deſcribed, are yet more fully repreſented in the fourth Plate.

Beſide the advantage that the common Teleſcopes give of being able better to diſtinguiſh a diſtant Object, they do alſo much facilitate the ſetting it true pointing to the Object with all the preciſeneſs imaginable; for after one has through this Teleſcope taken notice of the far diſtant Object, one may at the ſame time ſee very diſtinctly the Threads (or Wires) that are in the Teleſcope, and alſo all that which the ſaid Threads hinder to be ſeen of the Object, as if they were indeed ſtretched upon the very object it ſelf, and the Eye upon removing perceives no Paralax at all between the one or the other, provided the Fillets or Threads, as we have ſaid, be placed exactly in the focus of the Object Glaſs, becauſe 'tis in this place that the painting of the Object is made reverſed, which comes immediately to our Eye, and which is the place of the immediate Object, as may be eaſily underſtood by the following Figure.



A B C are three points of an Object, every of which fill the Object Glaſs D E of the Teleſcope F D E G with Rays; all theſe Rays having paſſed, traverſe the Glaſs D E, they proceed to reunite by order in three other points a b c, namely, thoſe of A in a, of B in b, and of C in c; then theſe ſame Rays are ſeparated again, and proceed to fall upon the Eye-Glaſs, which in fine turns them towards the Eye H, the Rays of C are not continued to the Eye, to the end that it may appear what muſt happen when it meets with an obſtacle in ſome part of the focus as in c, becauſe it is evident that this obſtacle hinders all the Rays of the point C, without permitting any one of them to arrive at the Eye, as if one had indeed covered the Object it ſelf at the point C; but this Obſtacle, ſuch as it may be, a ſingle filament of Silk, makes its diſtinct Image in the Eye preciſely in the place where the Object which it hinders would have made its own Image, becauſe the Eye is altogether diſpoſed for receiving the Rays which are come from the focus a b c travers the Eye Glaſs F G.

It is to be added hereto, that ſince all the Rays of the ſame point of the Object are reunited in another point of the focus of the Object Glaſs, it happens here that notwithſtanding all the aperture of the Object Glaſs D E, one has the ſame exactneſs for pointing as if the Object Pinnul or ſight were but one ſingle, ſmall, and almoſt indiviſible hole through which the point C could traject but one Ray, which might be intercepted by the leaſt obſtacle placed in the Line C c, becauſe that which neceſſitates the placing the Threads in the focus is for that if they are placed either nearer to or farther from the Object Glaſs, they cannot hinder all the Rays from the ſame point, which are not elſewhere united but only in the focus, and there will be ſome Parallax ſenſible if they be placed out of it, upon changing the poſition of the Eye, which however is moſt to be regarded when the aperture of the Object Glaſs is large, for if it be but ſmall, the place of the Threads does not require ſo very preciſe a diſtance from the Object Glaſs; becauſe at ſome diſtance on either ſide the focus, either nearer to or further from the Object Glaſs, the Rays are not ſo far ſeparated as to become ſenſible. And 'tis alſo in the ſtraitning or leſſening of the aperture of the Object Glaſs that an inconvenience may be prevented, which happens to the Threads when being well placed for a remote Object, they are not ſo exact for Objects that are nearer.

There may remain one difficulty upon the account of the Object Glaſs, if it be not of an equal thickneſs, thereby cauſing ſome refraction, and bending the principal Ray C c from a ſtraight Line. But notwithſtanding all the defects of this Glaſs, there is no reaſon to fear in reſpect of the Angles of poſition, or of the apparent diſtances which one would obſerve, becauſe when the two Teleſcopes are directed to the ſame Object at a diſtance, the fiducial Line of the movable rule (or arm) falls exactly upon the beginning of the firſt Degree. And this is a proof with which we ought always to begin when one would take Angles. We ſhall give in the ninth Article the means of remedying defects and refractions of Glaſſes in regard of heights.

The Figures 2, 3, 4, repreſent the pieces which ſerve to ſet the Quadrant upon its Foot. The piece L M movable upon the Foot K, ſuffices to ſet this Inſtrument to its plumb or perpendicular, when one would obſerve heights, but for putting it horizontal, the ſecond Piece O P muſt be added to L M, in the manner as is repreſented in the fourth Figure, and then one may give the Quadrant ſuch poſition as one will, as with a Knee.

Thus you have the full deſcription of the Inſtrument which gave the Angles of poſition with ſo much exactneſs, that upon the whole compaſs of the Horriſon taken at 5 or 6 Angles, there was not found above a minute more or leſs than it ought to be, and which often alſo happened within about 5 ſeconds of the juſt account, ſo that it was not neceſſary to carry a bigger Inſtrument, of which it was otherways impoſſible to make uſe in ſeveral occurrences.

ARTICLE VI.

THE diſtance which was propoſed to be meaſured from *Malvoiſine* to *Sourdon*, is found as 'twere parted into three Lines, to wit, from *Malvoiſine* to *Mareüil*, from *Mareüil* to *Clermont*, and from *Clermont* to *Sourdon*. Theſe particular diſtances were known by the means of 13 Triangles, repreſented in the firſt Figure of the ſecond Plate. There were two of them which needed no particular Obſervation, ſo that one may account but 11 principal Triangles, the other which are repreſented in the ſecond Figure of the ſame Plate, having chiefly ſerved for the verification. Here follows the liſt of Stations and preciſe Places to which Obſervations have been made for forming the Triangles.

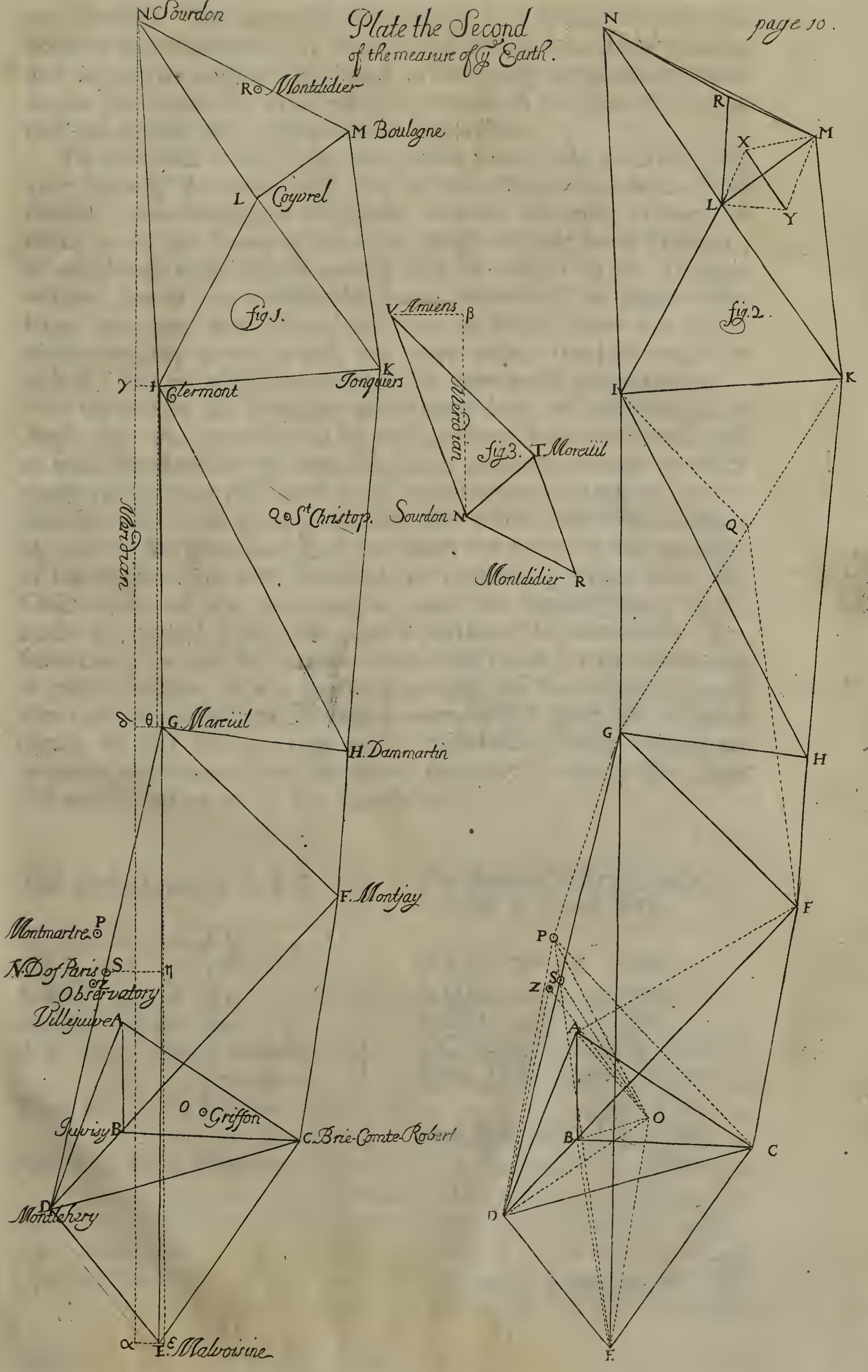
A *Is the middle of the Mill of* Villejuive.
B *The neareſt Coin of the Pavillion of* Juviſy.
C *The point of the Steeple of* Brie-Comte-Robert.
D *The middle of the Tower of* Montlehery.
E *The top of the Pavilion of* Malvoiſine.
F *A piece of Wood ſet up purpoſely on the top of the Ruines of the Tower of* Monjay, *and made larger with Straw tyed about it.*
G *The middle of the Hillock of* Mareuil, *where 'twas neceſſary to make a Fire for a mark.*
H *The middle of the great Pavilion in the Oval of the Caſtle of* Dammartin.
I *The Steeple of* S. Samſon *of* Clermont.
K *The Mill of* Jonquiers *near* Compiegne.
L *The Steeple of* Coyvrel.
M *A little Tree upon the Mountain of* Boulogne *near* Montdidier.
N *The Steeple of* Sourdon.
O *A little forked Tree upon the But of* Griffon, *near* Villeneuve S. Georges.
P *The Steeple of* Montmartre.
Q *The Steeple of St.* Chriſtopher*'s*, *near* Senlis.
AB *Is the firſt Baſe actually meaſured, of* 5663 *Pariſian Toyſes.*
XY *Is a ſecond Baſe of* 3902 *Toyſes, actually meaſured as the former.*

It can't be imagined that 'twas poſſible to place a large Quadrant at the point of Steeples, and of ſuch other Places as we made choice of for forming exactly the Triangles.

But that we might have a remedy for this, we always had a care to obſerve the apparent thickneſs of Objects towards which we

Plate the Second
of the measure of y^e Earth.

page 10.



we directed. For example, in pointing at a Tower we were not content to have taken only the middle, but of how many minutes and ſeconds its thickneſs appeared, which gave means afterwards to ſet the Inſtrument on what part one would of the ſame Tower, in caſe the middle were imbaraſſed or inacceſſible.

'Tis true that with all the precaution that could be taken, and after turning the Inſtrument two or three times towards the ſame ſtation, 'twas impoſſible ſometimes to avoid the error of ſome ſeconds upon the ſumm of the three Angles of the ſame Triangle; in which caſe there can be no difficulty of correcting the Triangle without fear of any conſiderable error, becauſe all the Angles were large, and there was always ſome one of which there was not ſo much certainty as of the reſt, and upon which the fault ought to be laid. The principal Corrections that were made are remarked.

In the Liſt of the Triangles this Rule is kept, of not giving any Angle that was not obſerved by the Quadrant before deſcribed, and to omit thoſe which we were obliged to conclude, though in effect there was no great difference to be made between the one and the other, becauſe of the great preciſeneſs with which they were directed at, and of the great care that was taken not to err in the quantity of the Angles that were obſerved, by reiterating ſeveral times the Obſervations of the ſame Angle, and the cauſing them to be made by ſeveral Obſervers who kept their Memoirs apart. Beſides that, in the firſt courſes that were made for the diſcovery of proper ſtations, all the Angles generally had been obſerved; and tho theſe were with leſſer Inſtruments, which gave the minutes but by ſix and ſix; yet they were not hindered from coming to ſo much exactneſs as was neceſſary to make it appear that they did not all fail or err in the Concluſions.

The Firſt Triangle A B C.

To find the ſide A C.
C A B 54° 4′ 35″.
A B C 95 16 55.
A C B 30 48 30.
A B 5663 Toyſes actually (meaſured
Then AC 11012 Toyſes five (Foot
And B C 8954 Toyſes.

The Second Triangle, ADC
for D C and A D.

D A C 77° 25′ 50″.
A D C 55 0 10.
A C D 47 34 0.
A C 11012 Toyſes 5 Foot.
Then D C 13521 Toyſes (three Foot.
And A D 9922 Toyſes two (Foot.

The third Triangle D E C.

For D E and C E.
D E C 74° 9′ 30″.
D C E 40 34 0.
C D E 65 16 30.
DC 13121 Toyſes 3 Foot.
Then D E 8870 Toyſes 3 Foot.
And C E 12389 Toyſes 3 Foot.

The fourth Triangle.

For D F.
D C F 113° 47′ 40″.
D F C 33 40 0
F D C 32 32 20.
D C 13121 Toyſes three Foot.
Thence D F 21658 Toyſes.

Note, *That in the* fourth Triangle, *the* Angle D F C *was augmented* 10″ *which were wanting to make up the ſumm of the three* Angles.

The V. Triangle DFG for DG and FG.

D F G 92° 5′ 20″.
D G F 57 34 0.
G D F 30 20 40.
D F 21685 Toyſes.
Thence D G 25643 Toyſes.
And F G 12963 Toyſes 3 Foot.

From theſe five Triangles 'twas eaſie to conclude the diſtance GE between *Malvoiſine* and *Mareüil*, without ſuppoſing any new Obſervation.

The VI. Triangle GDE for G E.

G D E 128° 9′ 30″.
D G 25643 Toyſes.
DE 8870 Toyſes three Foot
Thence G E 31897 Toyſes.

By the Calculation of the ſame Triangles were found the Angles D G E of 12° 38′, and D E G of 39° 12′ 30″, the ſame which they were found alſo by Obſervation, which may ſerve as a proof for G E. And it ought to be conſidered, that as this Triangle is but as a conſequence of the preceding, that it has two ſides known, and all the Angles well eſtabliſht, the ſmalneſs of the Angle DGE, cant hinder the certainty of the Concluſion for G E, beſides that hereafter the ſame diſtance G E ſhall be verifyed by other Triangles.

Upon the occaſion of theſe Angles D G E and D E G, it was that Fires were made at *Mareüil*, *Montlehere*, and *Malvoiſine*. A large Fire of three Foot made at *Mareüil* and ſeen from *Malvoiſine*, appear'd to the Eye like a Star of the third Magnitude.

'Tis not our deſign to draw hence any conjectures concerning the fixed Stars, but only to make the following remark, That if one conſiders the diſtance of 31897 Toyſes, the Fire which had three Foot of breadth ought to have been ſeen under an Angle of 3′ 14″, and yet when it was ſeen with the Teleſcopes of the Quadrant, of which the Object Glaſſes were excellent, it was not above half hid or covered by one of the ſilk Clews which were placed in the focus of the Teleſcope; now the bigneſs of this Filament (which was preſently meaſured with a Microſcope) was the three hundredth part of an Inch. It follows then that in a Teleſcope of 36 Inches it takes up the ſpace of about 4″. ſo that the Fire which it covered but half, took up the ſpace of eight ſeconds, though it ought in effect have appear'd but of three ſeconds.

From this Experiment it may be concluded that even with Teleſcopes, Luminous Objects do appear bigger than they ought. It were well to make trial of this with long Teleſcopes, which will be reſerved for another time.

We have ſaid above that the diſtance E N was divided into three Lines, the firſt, namely G E, has been Calculated, but before we paſs to the ſecond, 'twill be much to the purpoſe to verifie all that we have hitherto eſtabliſhed by ſeveral other Triangles.

Another way for A D by the Triangle A O B.

A O B 62° 22′ 0″.
A B O 75 8 20.
B A O 49 29 40.
A B 5663 Toyſes.
Thence A O 6178 Toyſes (2 Foot.

But by the Triangle A O D.
A O D 76° 50′ 0″.
A D O 37 19 20.
D A O 65 50 40.
A O 6178 Toyſes.
Thence A D 9922 Toyſes (2 Foot.
And D O 9298 Toyſes.

Otherwiſe for D E by the Triangle D O E.

D O E 47° 0′ 00″.
D E O 50 2 50.
E D O 82 57 10.
D O 9298 Toyſes.
Thence D E 8870 Toyſes (5 Foot.
Inſtead of 8870 Toyſes 3 Foot.

Otherwiſe for C E by the Triangle A C E.

A C E 88° 8′ 0″.
A E C 42 22 30.
E A C 47 24 30.
A C 11012 Toyſes five Foot.
Thence CE 12388 Toyſes two (Foot.
Inſtead of 12389 Toyſes three (Foot.

Yet otherwiſe for C E in Triangle B C E.

B C E 57° 19′ 30″.
B E C 44 55 45.
E B C 77 44 45.
B C 8954 Toyſes.
Thence E C 12390 Toyſes.
The Angle E B C being diminiſht 10″.

Otherwiſe yet for C E in Triangle P D C.

P D C 65° 31′ 0″.
P C D 62 2 40.
D C 13121 Toyſes three Foot.
Thence P C 15064 Toyſes three Foot.
And D P 14621 Toyſes three Foot.

But in the Triangle P C E.

P C E 102° 36′ 40″.
P E C 43 9 30.
P C 15064 Toyſes three Foot.
Thence C E 12389 Toyſes inſtead of 12389 Toyſes three Foot.

Otherwiſe for D F in Triangle A C E.

A C F 66° 13′ 40″.
A F C 50 33 20.
F A C 63 13 00.
A C 11012 Toyſes five Foot.
Thence A F 13051 Toyſes.

But in the Triangle F A D.

F A D 140° 38′ 50″.
A F 13051 Toyſes.
A D 9922 Toyſes.
Thence D F 21657 Toyſes three Foot.
For 21658 Toyſes.

Otherwiſe for F G in Triangle G A F.

G A F 52° 8′ 50″.
G F A 75 12 10.
F G A 52 39 00.
A F 13051 Toyſes.
Thence F G 12963 Toyſes for 12963 Toyſes 3 Foot.

The ſumm of the two Angles A F C, G F A exceed by 10″, that of the two C F D, D F G, which is neglected, becauſe an error ſo little conſiderable deſerves not the expoſing one ſelf a ſecond time to danger in mounting to the top of the Tower of *Monjay* which is half ruined.

Otherwiſe for G E in Triangle G D C.

G D C 62° 53′ 0″.
D G 25643 Toyſes.
D C 13121 Toyſes three (Foot.
Thence G C D 86° 24′ 25″.
And G C 22869 Toyſes three (Foot.

But in the Triangle G C E having put together GCD and DCE.

G C E 126° 58′ 25″
G C 22869 Toyſes three (Foot.
C E 12389 Toyſes three (Foot.
Thence G E 31893 Toyſes (three Foot.
Inſtead of 31897 Toyſes, but parting the difference we make G E 31895 Toyſes.

The VII. Triangle F G H.

For G H.
F G H 39° 51′ 0″.
F H G 91 46 30.
H F G 48 22 30.
F G 12963 Toyſes three (Foot.
Thence G H 9695 Toyſes.
In this Triangle the Angle G F H is diminiſht 10″.

The VIII. Triangle G H I.

For G I and I H.
G H I 55° 58′ 00″.
G I H 27 14 00.
I G H 96 48 00.
G H 9695 Toyſes.
Thence G I 17557 Toyſes.
And H I 21037 Toyſes.

Another way for G I in Triangle Q F G.

Q F G 36° 50′ 0″.
Q G F 104 48 30.
G F 12963 Toyſes three Foot.
Thence Q G 12523 Toyſes.
But in the Triangle Q G I.
Q G I 31° 50′ 30″.
Q I G 43 39 30.
Q G 12523 Toyſes.
Thence G I 17562 Toyſes.
And Q I 9570 Toyſes.

By the Triangle Q H I, G I is found of 17557 Toyſes only, but for a reaſon we ſhall after ſhew, the laſt calculation is followed, which makes G I of 17562 Toyſes, and by conſequence H I 21043 Toyſes.

The IX Triangle H I K for I K.

H I K 65° 46′ 00″.
H K I 80 59 40.
K H I 33 14 20.
H I 21043 Toyſes.
Thence I K 11678 Toyſes.

The ſumm of theſe three Angles being too great by 20″, by which the Angle H K I is diminiſhed, upon which it ſhould be noted that the point H taken for the middle of the great Pavillion on the oval of the Caſtle of *Dammartin* was difficult to determine when obſerved from the ſtation K; and that it may happen in a diſtance of 19436 Toyſes, the Eaſt ſide of this Pavillion appear'd greatned by ſome other adjoyning Objects, which cauſed the Angle H K I to be obſerved bigger than it ought.

Otherwiſe for I K in the Triangle Q I K.
Q I K 49° 20′ 30″.
Q K I 53 6 40.
Q I 9570 Toyſes.
Thence I K 11683 Toyſes.

After that which has been ſpoken concerning the point H, there is cauſe to reſt ſatisfied rather in this laſt Calculation than in that of the Triangle H I K, ſo much the more for that we being aſſured to have pointed moſt exactly at the Steeple of St. *Chriſtopher*, which was ſeen on all ſides like a very fine Needle.

We were not able to place the Quadrant in the Steeple, nor in that of *Coyvrel* for obſerving the Angles, which we were therefore obliged to conclude. But we took ſo much care in obſerving all the other Angles, and the Inſtrument gave the Circuit of the Horiſon ſo exactly, that there ought to remain no doubt at all upon that.

The X. Triangle I K L for K L and I L.

L I K 58° 31′ 30″.
I K L 58 31 00.
I L 12683 Toyſes.
Thence K L 11188 Toyſes two Foot.
And I L 11186 Toyſes four Foot.

The XI. Triangle K L M for L M.

L K M. 28° 52′ 30″.
K M L 63 31 00.
K L 11188 Toyſes two Foot.
Thence L M 6036 Toyſes two Foot.

The XII Triangle L M N for L N.

L M N 60° 38′ 00″.
M N L 29 28 20.
L M 6036 Toyſes two Foot.
Thence L N 10691 Toyſes.

The XIII Triangle I L N for N I.

The ſumm of the Angles I L K K L M M L N, being taken from 360, there remains
I L N 119° 32′ 40″.
But L N 10691 Toyſes.
And I L 11186 Toyſes four Foot.
Thence I N 18905 Toyſes.

So it is that upon the foundation of the firſt Baſe A B, which was actually meaſured, we have concluded the length of the three Lines E G, G I, I N, from *Malvoiſine* to *Sourdon*.

But becauſe the four laſt Triangles were not accompanied with a verification, and becauſe we had a great deſire to have a new clearing of the matter upon the VIII and IX Triangles, we judged it neceſſary to come to an actual meaſure of a new Baſe.

The Line of diſtance L M between *Coyvrel* and the Mountain of *Boulogne* was found the moſt proper to ſerve for this laſt verification, not at all for that this Line could be actually meaſured, but becauſe it paſſed a croſs a great plain where we had the convenience to take the tranſverſal Baſe X Y from the Mill of *Mery*, even almoſt to the Valley of St. *Martin* within a pace of *Mont-dedier*.

Which Baſe actually meaſured with the ſame Pike Staves made uſe of for the firſt meaſuring, and which had been verified all *de novo*, was found of 3902 Toyſes. See here the Calculation which was made thereupon.

Of the Triangle X Y L.

X Y L 50° 37′ 40″.
Y X L 54 10 45.
X Y 3902 Toyſes of actual
(meaſure.
Thence Y L 3273 Toyſes two
(Foot.

But in the Triangle X Y M.

X Y M 56° 46′ 15″.
Y X M 65 20 45.
X Y 3902 Toyſes.
Thence M Y 4187 Toyſes.

In fine, in the Triangle M Y L

M Y L 107° 23′ 55″.
Y L 3272 Toyſes three Foot.
Y M 4187 Toyſes.
Thence M L 6037 Toyſes inſtead of 6036 Toyſes 2 Foot.
Then by proportion IN 18907
(Toyſes.
And G L 17564 Toyſes.
But the EG ought to be left becauſe it has been ſeveral ways verified.

That ſmall difference there was found between the diſtance which was concluded from the firſt Baſe, and that which we found by the laſt, made us ſee we had reaſon to ſuſpect the Triangles which butted at the point H, and that thoſe of the point Q had better deſerved to paſs for the principal. But we had no mind at all to change the order we have kept.

ARTICLE VII.

Though our firſt deſign were to terminate all our meaſures at *Sourdon*, yet we found a neceſſity as 'twere of continuing them to *Amiens*, where we reſolved to go to take the heighth of the Pole for verifying the Calculation of *Fernelius*. We would willingly have had time enough to have ſought out in the Plains of *Santerre* ſome point proper for finiſhing this meaſure by two great Triangles. But the Seaſon being already too far advanced, we were fain to content our ſelves with what we met with in the borderings of *Sourdon*, where it was neceſſary to ſtay for taking the heighth of the Pole.

R is the Steeple of St. *Peter* of *Montdidier.*
T a Tree upon the Mountain of *Mareüil.*
V the Steeple of *Noſtre Dame d' Amicus.*

Second Plate 3d Fig.

In the Triangle L M R.

L M R 58° 21′ 50″.
M R L 68 52 30.
L M 6037 Toyſes.
Thence L R 5510 Toyſes (three Foot.

In the Triangle N R L.

N R L 115° 01′ 30″.
R N L 27 50 30.
L R 5510 Toyſes three Foot.
Thence N R 7122 Toyſes (two Foot.

In the Triangle N R T.

N T R 72° 25′ 40″.
T N R 67 21 40.
N R 7122 Toyſes two Foot.
Thence N T 4822 Toyſes four (Foot.

In fine in the Triangle N T V.

N T V 83° 58′ 40″.
T N V 70 34 30.
N T 4822 Toyſes four Foot.
Thence N V 11161 Toyſes (four Foot.

Some have thought that we ought to have added to all theſe Calculations the true poſition of the Towers of *Noſtre Dame* of *Paris*, and of the Obſervatory.

S is a Lanthorn over the ſtairs of the South Tower of *Noſtre Dame* of *Paris.*

Second Plate, firſt and 2d Figures.

Z is the middle of the South Face or Front of the building of the Obſervatory.

In the Triangle D O S.

D O S 88° 16′ 40″.
D S O 46 35 00.
S D O 45 8 20.
D O 9298 Toyſes.
Thence D S 12795 Toyſes.
And O S 9373 Toyſes.

In the Triangle D O Z.

D O Z 82° 5′ 10″.
D Z O 51 34 00.
Z D O 46 20 50.
D O 9298 Toyſes.
Thence D Z 11757 Toyſes.
And O Z 8588 Toyſes three (Foot.

ARTICLE VIII.

After having meaſured the particular Diſtances between *Malvoiſine*, *Mareüil* and *Sourdon*, and having added to thoſe that of *Amiens*, the poſition of each of theſe Lines in reſpect of the Meridian ought to be examined.

Firſt Plate

For this purpoſe in the Month of *September*, 1669, we went upon the Hillock of *Mareüil*, at the place marked G, where we could ſee *Malvoiſine* on the one ſide and *Clermont* on the other, and placing the Quadrant furniſht with two Teleſcope ſights perpendicular upon its foot, ſo that the Teleſcope EF remained always in the level, whilſt the plain of the Inſtrument was turned vertically, and that the Teleſcope ſight of the Alidade GH pointed at the Polar Star. This Star was ſo followed to its greateſt digreſſion, where it remained a very ſenſible ſpace of time without parting from the vertical filament of the Teleſcope with which it was obſerved, then leaving the Inſtrument fixed in its poſition the remainder of the night, even until the day was come, we could diſcover the place on the border of the Horiſon, to which the Teleſcope EF was found to point; and determine by this means the vertical of the greateſt digreſſion of the Polar Star. For 'twas known by experience, that when the Quadrant was ſet to its plumb, the two Teleſcopes always remained pointed in the ſame vertical.

By this Obſervation which was divers times reiterated, we were aſſured of a diſtant point which markt the vertical Circle of the greateſt Oriental Digreſſion of the Polar Star; which vertical made with the line GI an Angle of 4° 55′ towards the Eaſt. The complement of the declination of the Polar Star being then 2° 28′, and the height of the Pole on the Hillock of *Mareüil*, as it was afterward found 49° 5′; and by conſequence the digreſſion of the Polar Star was 3° 46′, then there remained yet one Degree and nine Minutes, by which the line GI declined from the North towards the Weſt; and becauſe that otherways the lines GI GE make an Angle of 178° 25′ toward the Weſt, which Angle augmented by the declination of the line GI makes but 179° 34′. it followed that GE declined 26′ from the South towards the Weſt.

The following Year in the Month of *October*, there was choſen by *Sourdon* in the line NV, a place in the open Field, whence the Steeple of *Noſtre Dame* of *Amiens* could be diſcovered, and in the manner explained, 'twas obſerved ſeveral times that this line NV declined 18° 55′ from the North towards the Weſt, whence it was eaſie to conclude that NI declined by 2° 9′ 10″ from the South towards the Eaſt.

Theſe laſt Obſervations were made in a time wherein the Pole Star was found in its greateſt digreſſion a little after Sun ſet, and thereby we had the convenience of finiſhing the Obſervation all at once, without being obliged to leave the Iuſtrument in its poſition, becauſe

cauſe 'tis one of the advantages of the Telleſcope Sights, that by means of them one may diſcover the fixed Stars of the ſecond magnitude in the greateſt clearneſs of the *Crepuſculum*, and that thoſe of the firſt Magnitude may be obſerved in full Sun-ſhine, which will be a great help to Aſtronomy; we have made ſeveral curious Obſervations, which we ſhall hereafter Publiſh.

Second plate, third Figure.

If we ſuppoſe then that the Meridian Line of *Sourdon* be prolonged toward the North, till it meets the parallel of *Amiens* at the point β for the making the Rectangle Triangle N β V, the Angle of Declination V N β, being 18° 55′ and the hypothenuſe N V, being found 11161 Toyſes, 4 Foot, it follows that the Meridian Diſtance N β between the parallels of *Sourdon* and *Amiens* is 10559 Toyſes, 3 Feet, and that the Arch of the Parallel V β compriſed between *Amiens* and the Meridian of *Sourdon* is 3617 Toyſes, 4 Foot.

Second Plate, firſt Figure.

After the ſame manner if we ſuppoſe that the ſame Meridian Line of *Sourdon* be prolonged towards the South, till it meets with the Parallel of *Malvoiſine* at the point α, and that this Meridian be divided into three parts by the perpendiculars G δ I γ which repreſent the Parallels of *Mareüil* and *Sourdon*, that moreover the particular Meridian Lines of thoſe places be drawn, to wit, G ε, from *Mareüil* to *Malvoiſine*, and I θ from *Clermont* to *Mareüil*.

In the Triangle N γ I, rectangled in γ.

N I 18907 Toyſes.
γ N I 2° 9′ 10″.
Thence N γ 18893 Toyſes,
(3 Foot.
And γ I 710 Toyſes.

In the Triangle G I θ, rectangled in θ.

I G 17564 Toyſes.
G I θ 1° 09′ 00″.
Thence I θ or γ δ, 17560 Toy-
(ſes, 3 Foot.
And G θ 352 Toyſes.

In the Triangle G E ε rectangled in ε.

G E 31895 Toyſes.
E G ε 00° 26′ 00″.
Thence G E or δα, 31894
(Toyſes.
And E ε 241 Toyſes, 3 Foot.

The 3 lines N γ, I θ, G ε, make together the whole Diſtance between the Parallels of *Sourdon* and of *Malvoiſine*, of 68347 Toyſes, 3

3 Foot; to the which Diſtance adding that between the Parallels of *Sourdon*, and of *Amiens*, which has been found of 10559 Toyſes, 3 Foot, we have the Diſtance between *Malvoiſine*, and the Parallel of *Amiens* of 78907 Toyſes: And tho in effect the four Lines of which this whole Diſtance is compoſed, are as it were the ſides of a Polygon, which one would deſcribe about the Earth; and that 'tis true in Geometrical Rigor, that the compaſs of ſuch a Polygon is bigger than the circumference of the Earth; yet is it notwithſtanding ſo little different in this caſe, that 'twill be to no purpoſe to take notice of it; ſince the exceſs upon every Degree does not amount at moſt to the quantity of 3 Feet, ſo that we may conſider all theſe particular Lines of which the total Diſtance N *a* is compoſed, as inſenſibly different from the Curviture of a Meridian.

For what remains, as we have above given the poſition of the Towers of *Noſtre Dame de Paris*, and of the Obſervatory, it will be alſo eaſie for us to eſtabliſh the Diſtances of theſe ſame places in reſpect of the parallels of *Malvoiſine*, and of *Amiens.*

For firſt, if from G D, which is of 25643 Toyſes, there be taken D S, found before of 12795 Toyſes, there will remain 12848 Toyſes for G S, which is the Diſtance between *Mareüil*, and the Towers of *Noſtre Dame*: This Line G S makes with G E, an Angle of 12° 34′ 30″, toward the *Weſt*, and by conſequence alſo it declines towards the *Weſt* by 13° 00′ 30″. Then having drawn S *n*, which let be perpendicular to the Meridian of *Mareüil*, and which repreſents an Arch of the parallel of the Towers of *Noſtre Dame*, we have

In the Triangle G *n* S rectangled at *n*.

G S 12848 Toyſes.
n G S 13° 00′ 30″.
Thence G *n* 12518 Toyſes.
And S *n* 2892 Toyſes.

Second Plate.

Then if from G *e*, which is of 31894 Toyſes, be taken G *n* 12518 Toyſes, there remains *n* *e* of 19376 Toyſes, for the Diſtance between the Parallels of *Noſtre Dame*, and of *Malvoiſine*, which may alſo be yet further verified by the following Calculation.

In the Triangle S D E.

S D E 128° 5′ 30″.
S D 12795 Toyſes
D E 8872 Toyſes.
Thence E S 19556 Toyſes.
And D E S 30° 59′ 30″.
But D E G 39 12 30.
Thence S E G 8 13 00.

But E G declines by 26′ from the *North* towards the *Eaſt*, thence E S declines by 7° 47′ from the *North* towards the *Weſt*; and becauſe that the length of this ſame Line E S is 19556 Toyſes, it follows, That the diſtance between the Parallels of *Noſtre Dame*, and of *Malvoiſine*, is 19376, as by the former Calculation.

In fine, in the Triangle Z D E.

Z D E is 129° 18′.
Z D is 15757 Toyſes.
D E 8871 Toyſes.
Thence E Z 18685 Toyſes.
And D E Z 29° 08′ 30″.
But D E S is 30 59 20.
Thence SEZ is 01 50 50.

The laſt Angle S E Z being added to the Declination of the Line E S which was above found of 7° 47′ makes the Declination of E Z of 9° 38′; but the length of this ſame Line E Z is of 18685 Toyſes; thence by Reduction the Diſtance between the Parallels of *Malvoiſine*, and of the Obſervatory, ſhall be of 18421 Toyſes: And in fine, that between the parallels of *Noſtre Dame* and that of the Obſervatory, ſhall be of 955 Toyſes, 3 Foot.

And tho in all our Obſervations which we made for determining the Poſition of divers Lines with reſpect to the Meridian, we did not at all make uſe of the Compaſs (or Magnetical Needle) yet this hindred not, but that we obſerved the Declination of the Needle in ſeveral places principally at *Malvoiſine* and at *Sourdon*: The Needle of the Compaſs which we carried, was 5 inches long, and its Declination at theſe two places, toward the end of the Summer of the Year 1670, was found to be 1° 30′ from the North toward the Weſt, or thereabout, as we had ſome little time before obſerved it at *Paris*, with the ſame Compaſs, although at *Paris* the ſame

Needle in the Year 1666 had no declination ſenſible, and in the Year 1664 it declined 40′ towards the *Eaſt*, the variation thereof having been every Year above 20′.

ARTICLE IX.

FOR concluding in fine the Magnitude of a Degree, and by conſequence that of the Earth, it remains yet to know what parts of the Meridional Diſtances we have meaſured with the Toiſe of *Paris* , do anſwer to Minutes and Seconds, conſidering them as parts of a great Circle which ſhould be deſcribed round about the Earth.

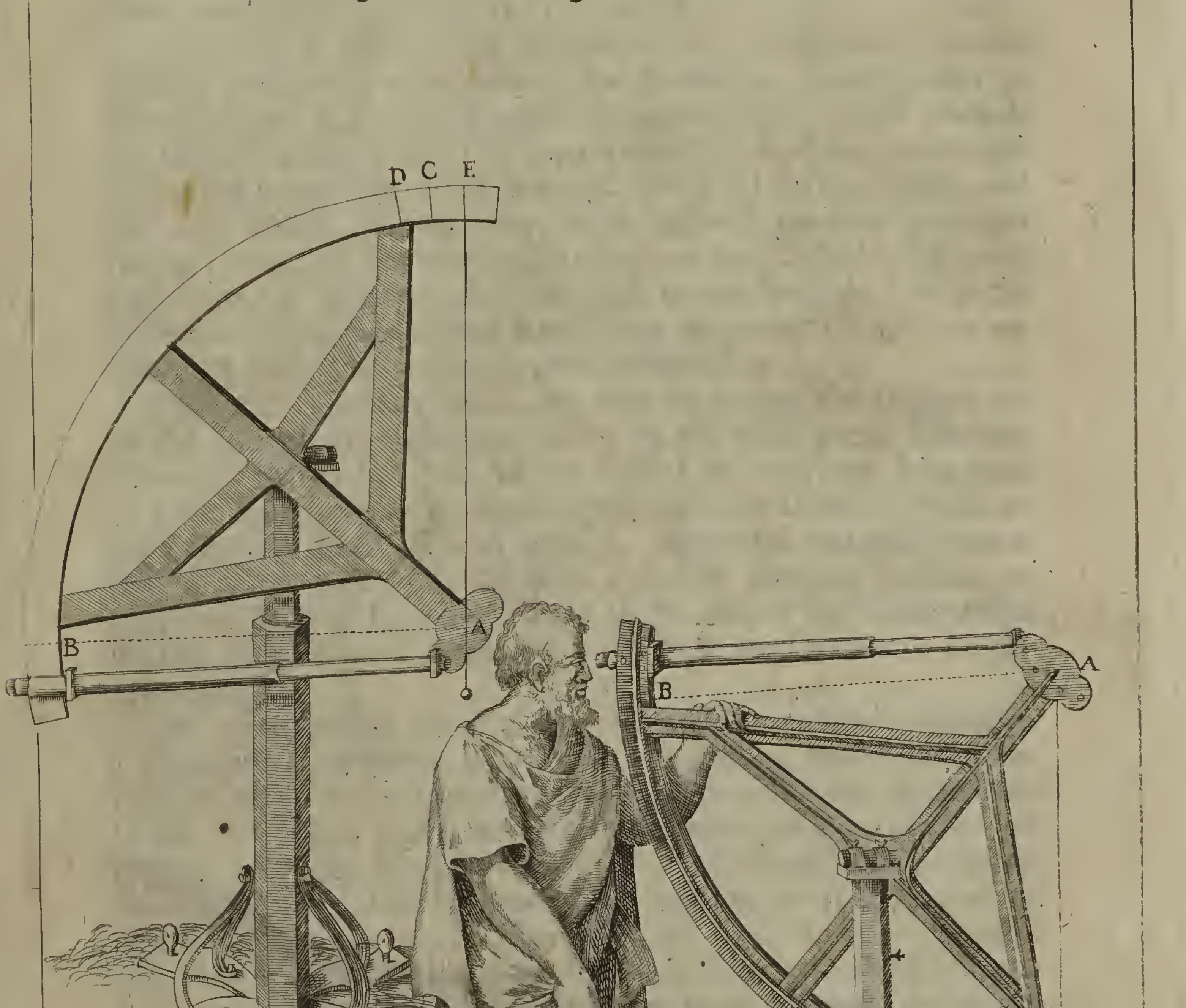
'Tis upon this occaſion that we are obliged to ſearch in the Heavens the Meaſure of the Earth, for we muſt neceſſarily have recourſe to the difference of the Latitudes of the two places eſtabliſhed under one and the ſame Meridian, and by this means come to the knowledg of the Arch of the Heavens compriſed between the Zeniths of the ſaid Places, the which Arch is alike to that which we have meaſured upon the Earth.

But before we paſs to the Celeſtial Obſervations, it will be to the purpoſe to ſhew after what manner the Inſtruments were verified with which the obſervations were made ; which is here ſo much the more neceſſary, for that the Telleſcopes which we made uſe of might have had ſome latent defect, which could not be known, but by a particular Proof.

Plate the third. The firſt Figure of the 3d plate repreſents the Quadrant fitted upon its Foot in the ordinary manner as for taking of heights, or for directing at an Object far diſtant towards Edges of the Horizon ; but in the 2d Figure the ſame quadrant is reinverted, turned from the right to the left, and directed at the ſame Object as before , in ſuch ſort, that the plumb line which in the former poſition was ſuſpended at the Center A, and beat upon the Limb in D, is now hung upon the Limb in E, and beats preciſely upon the Center A, the Inſtrument is alſo placed upon a place more elevated, to the end that after the Reverſing, the Teleſcope might lie very near in the ſame line as before, tho in effect it is ſufficient that it remain in a Line parallel to the former; as it will always happen if the diſtance of the Object be ſo great, that the alteration cauſed by the reinverſion be not at all conſiderable, or at leaſt if two Objects are directed at, one of which is as much below the other as the Telleſcope is altered by the reinverſion.

Suppoſing then that before the reinverſion, one has marked upon the Limb of the Quadrant, the point D, where the plumb line beats, and after the reinverſion one has alſo mark'd the point E, where the plumb line is to be hanged, the Point C taken in the middle of the Interval D E ſhall determine the beginning of the diviſion of the Quadrant, and if after the inſtrument be put into its former poſition the plumb line comes to beat upon the point C, the Telleſcope ſight muſt

Plate the Third of the measure of the Earth pa. 24.



neceſſarily be directed in the level line; ſo that if by chance they are at firſt ſight ſo pointed, there will be found no other than the ſame point before and after the reinverſion.

The reaſon of this method is eaſie to be comprehended, becauſe without conſidering what paſſes in the Teleſcope, if we ſuppoſe that the right line A B (which paſſes by the center A) tends towards the Object to which the Teleſcope is directed, then the two Angles which the plumb line makes with the line A B, the one under, and the other above, ſhall be either right Angles or equal to two right Angles; they ſhall be right Angles when one has directed in the level, but if one has directed either too high or too low, the half of the difference of the two Angles taken from the greateſt Angle, or added to the leaſt, ſhall reſtore or give the level line.

This practice is very uſeful, not only for placing the Degrees upon the limb of an Inſtrument, following the effect of the Teleſcope whatever it may be; but 'tis yet further for verifying from time to time, whether the Teleſcope agree with the Diviſion which we have ſuppoſed good and well centred. But to the end this Verification may be made with the more eaſe, the Degrees ought to be continued from C towards E, even to the end of the limb, which for this purpoſe ought to be greater than it need to be for 90 Degrees only,

One may verifie a Sextant very near after the ſame manner as a Quadrant, as we may eaſily ſee by conſidering, that if before the reinverſing of the Inſtrument there be ſuſpended from the middle of the line A B, a plumb line which falls upon the poiut of the 60*th* Degree, counting from B towards D, and afterwards the Inſtrument being reinverſed, the ſame line hanging on the point of 60 Degrees, falls upon the middle of the line A B. In the one and in the other of theſe poſitions the line A B ſhall be in the level, and by conſequence the Teleſcope ought to have remained pointed at the ſame diſtant Object which did mark the level line. But if on the contrary the Teleſcope be found to point to two Objects, of which one is above the other, the middle between the two ſhall be the level line. Now the Angle of difference between the level line and the one and the other of thoſe Objects, or indeed the half of the Angle of the appearing diſtance between the two Objects, ſhall after be eaſily meaſured with a great Teleſcope in the manner as we meaſure the Diameters of the Planets: And by this means we know the error of the Inſtrument, the which ſhall augment the heigths, if before the reinverſment, and in the ordinary poſition, the Inſtrument be pointed at that Object which is loweſt, and on the contrary it ſhall diminiſh the heigths, if the Inſtrument is found at firſt pointed at that Object which was the higheſt.

The firſt and ſecond Figures of the 4*th* Plate repreſent an Inſtrument, which containing fewer Degrees than a Sextant, cannot be verified to the level, but only to the Zenith. This Inſtrument is pointed in two differing manners to the ſame Star near the Zenith. For in the firſt Plate 4*th*.

Figure the plumb falls in D upon the Degrees of the Limb. And in the ſecond as the Inſtrument is counterturned the ſame Plumb falls without, and is approached to the Teleſcope in E. Now it is eaſie to ſee that if one draws the line A B from the center A through the middle between the points D and E, marked by the two poſitions of the plumb Line, it ſhall determine the place of the Limb where the firſt Degree of account from the Zenith ought to begin, becauſe that when the Teleſcope ſhall be pointed to the Zenith, the line of the plumb ſhall agree neceſſarily with the line A B.

This ſecond manner of verifying is general for all ſorts of Inſtruments, but it is difficult and cannot at all times be practiſed, becauſe it requires a Star which ſhall be ſo near the Zenith, that after the Inſtrument is counterturned, and that it is pointed to this Star, the Plumb may always fall between the point B and the Teleſcope.

All thoſe Inſtruments which ſerve to take heights, and which have an Alidade which one can take away when one will, are eaſie to be verified. The Inſtrument ought to be placed in the plain of the Meridian, making it perfectly immovable as if it were fixed againſt a Wall in ſuch a ſort, notwitſtanding that the Plumb beating towards the middle of the Limb, leaves on the one and the other ſide ſo many Degrees as are neceſſary for the Obſervations which are to be made with it. Two fixed Stars are to be made choice of, whereof the one ought to paſs on this ſide, and the other on that ſide of the Zenith, and of which the difference or the ſumm of their Declinations do not ſurpaſs the number of the Degrees marked upon the Inſtrument. This being ſuppoſed, the two Stars are to be obſerved with the Teleſcope upon the Alidade according to the meaſure which they paſs the Meridian, the one towards the North, and the other towards the South ; and then provided the Inſtrument remains immovable, the difference between the two Obſervations will give exactly the Arch of the Meridian between the parallels of the two Stars, independent from all that could happen on the account of the Teleſcope of the Alidade. This preparation being made, the Alidade is to be taken off for putting a plumb Line in its place, and one muſt obſerve with the Teleſcope which is faſtened to the Inſtrument, the apparent diſtance which is between the Zenith and each of theſe Stars taken in the Meridian, if the Inſtrument depreſſes, the ſumm of the two diſtances found by this laſt manner ſhall be too great ; and on the contrary, if it Raiſes, then it ſhall be too little in compariſon of the total diſtance found by means the Alidade in ſuch manner, that the half of the difference ſhall be the Error of the Inſtrument.

One may make a ſecond Verification by obſerving one Star only, the diſtance of which from the Zenith doth not exceed the number of the Degrees of the Inſtrument to be verified, but in lieu that in the preceeding manner there was no neceſſity to have compared the

Teleſcope of the Inſtrument with that of the Alidade. It is neceſſary here that they muſt be both well adjuſted together at one and the ſame far diſtant Object. This being ſuppoſed, one obſerves firſt with the Plumb, and with the Teleſcope faſtned to the Inſtrument, the Meridional diſtance between the Zenith and the Star propoſed, next one fixes this Inſtrument in the plain of the Meridian, as in the preceding manner, but in ſuch ſort, that it may be counterturned, and that if the Star be towards the South, it returned as 'twere for obſerving towards the North, and one obſerves exactly the Degree and Minute of the Limb where the Plumb beats. After this the the Plumb being taken off, one applies the Alidade, with which one obſerves the Meridional Diſtance between the Zenith and the Star, counting for this effect the Degree and Minutes which are found between the fiducial line of the Alidade,and the part of the limb where the plumb did beat before. The firſt diſtance that was found being compared with this laſt, ſhall be too little if the Inſtrument elevates; and on the contrary, it ſhall be too big if it depreſſes in ſuch ſort that the half of the difference ſhall be the error of the Inſtrument.

After one has known the error of the Inſtrument, and that one is aſſured that it comes not but by the Teleſcope, the ſhorteſt and eaſieſt way is to let it alone, and to have regard to it in the Obſervations; but if one would correct it, this may be done either by diſplacing the Filaments of the Teleſcope, or by turning the Object Glaſs upon its Center; ſo far as one knows by experience it is neceſſary for adjuſting the Teleſcope to the Degrees of the Inſtrument. An Alidade furniſht with its Teleſcope may be of great help to make this correction; for this purpoſe one points to one and the ſame diſtant Object, as well the Teleſcope of the Alidade as that of the Inſtrument. Next, if the error is, for example, of one Minute in elevating, one ſets back the Alidade a Minute; or on the contrary, one puts it nearer it, as much if the error be in depreſſing; and having faſtned it in this poſition, by removing the Inſtrument all together, one makes the Teleſcope of this Alidade to ſtand pointed at the ſame Object as before; after which you muſt turn the Object Glaſs of the Teleſcope, which is faſtned to the Inſtrument upon its Center, till ſuch time as it be found pointed to the ſame Object; and by this means one may be aſſured, that a right line which ſhall be drawn from the Object by the Center of the Inſtrument, comes to meet the point B, which we ſuppoſe to have been eſtabliſhed for the beginning of the deciſion.

But for avoiding as much as is poſſible the refractions of the Teleſcope, care muſt be taken that the Object Glaſs be well centred, which may be diſcovered by making it reflect the Rays of the Sun, becauſe if it be well centred, the little focus which it makes by reflection at a certain diſtance, will be found exactly in the middle of a much greater round of light. Or elſe one may obſerve that the two Images which the Glaſs reflects of the ſame Object, come to unite in the middle of its ſurface.

After

After this preparation it will be to the purpoſe to faſten the Object Glaſs apart in a Copper Box pierced through its two ends, and perfectly turned round ; in which, nevertheleſs, it muſt have a little play in ſuch ſort that one may a little thruſt it from one ſide to t'other by three Screws with their heads cut off to hold it ſteady ; and this Box being exactly enchaſed into the Objective Pinnule, one may make it turn upon its Center, mean while the whole body of the Teleſcope remains immoveable ; and one may obſerve, that if in making the Object Glaſs ſo to turn, the Teleſcope always remains pointed to the ſame Object, otherwiſe the Object Glaſs muſt be moved either to the one ſide or the other.

We thought it neceſſary to give all theſe differing ways of verification, to the end that there might remain no doubt as to the great exactneſs which one ought to look after in Teleſcopes uſed for Pinnules or ſights of Inſtruments.

ARTICLE X.

IF the meaſure of the Earth requires preciſe and exact Obſervation, it is principally for that which concerns the difference of Latitudes, becauſe the error of one Minute only amounts to 951 Toyſes, which is multiplyed upon the whole as many times as the diſtance meaſured is contained in the whole Circumference of the Earth.

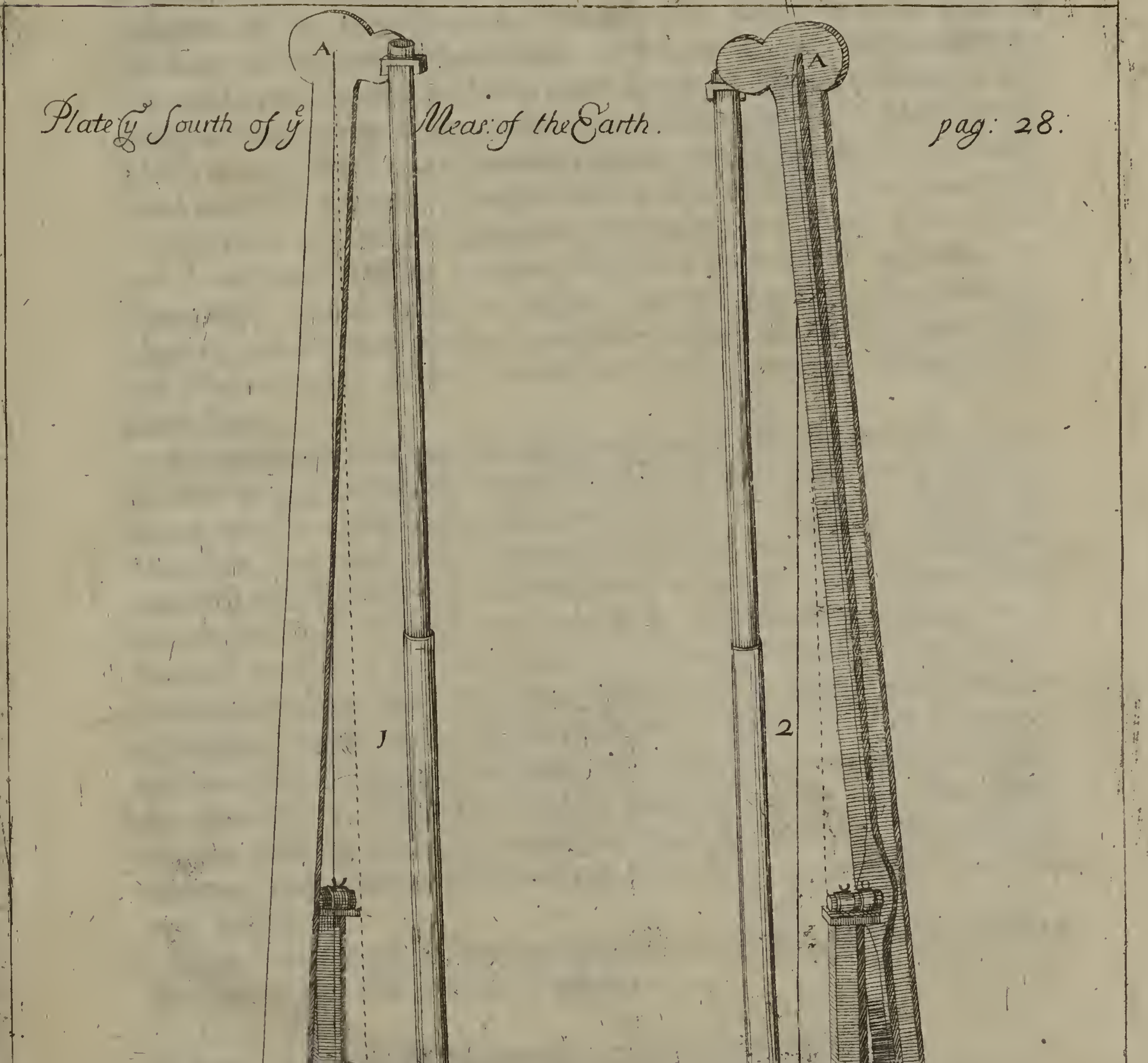
Plate *4th, 1ſt* and *2d* Figure. For approaching as much as is poſſible to the exactneſs requiſite, the great Inſtrument repreſented in the fourth Plate was cauſed to be made ; it is of Iron ſtrengthened with pieces upon the Arda of it, as the Quadrant, and covered with Copper at the places neceſſary. The Limb, which contains not above the 20*th* part of a Circle of ten Foot Radius, is divided by Dragonal Lines even to thirds of Minutes very diſtinctly.

A Teleſcope of ten Foot ſerves for Pinnules or Sights to this Inſtrument. And becauſe that in the obſcurity of the Night one could not ſee the Filaments that were in the Teleſcope, they were enlightened by the upper end of the Teleſcope, or by a hole made on the ſide.

The Plumb or Perpendicular was ſecured in a Pipe of Tin, which kept it intirely covered from the Wind, beſide that they always obſerved in a cloſe place, of which the cover or roof was purpoſely pierced.

For determining with this Inſtrument the differences of the Latitude of *Malvoiſine*, of *Sourdon*, and of *Amiens*, the Star called the *Knee of Caſſiopea* was made choice of, which comes to the Meridian at 9 or 10 Degrees of diſtance from the Zenith towards the North, about 28′ 46″ of time after the Polar Star. A Star more near to the Zenith would have been more difficult to be well obſerved. And if otherwiſe it ſhould have been placed between two Zeniths, the error of the Inſtrument which might not poſſibly be ſo

Plate ye Fourth of ye Meas: of the Earth. pag: 28.



ſo perfectly diſcovered, would have been doubled in the apparent diſtances of the two Zeniths, becauſe you muſt then have taken the ſum of the two Obſervations. Whereas when a Star is always obſerved towards one and the ſame Coaſt of Heaven, there is nothing in this caſe to be taken but the difference of the Obſervations, which cannot chuſe but be exact, becauſe the Inſtrument is well centered and well divided, though the Pinnules or Sights had been falſe.

The Knee of *Caſſiopea* augments its declination every Year about 20″; we were deſirous to have choſen a Star which had been leſs changing, as had been the bright Star of *Lyra*, or ſome one of *Cygnus*; but we had cauſe to fear, that before we ſhould have made our Obſervations, the Sun would have been too near approached to theſe Stars.

We commonly begun the Obſervations of the Heavens with that of the heigth of the Pole with the Quadrant, and every Evening about two or three hours before the Knee of *Caſſiopea* was in the Meridian, we took with the ſame Quadrant one heigth of this Star, marking the Inſtant of Obſervation by means of a Pendulum Clock which gave half ſeconds, and which was regulated according to the Diurnal motion of the fixt Stars, and then forthwith found by Calculation at what Hour and what Inſtant of the ſame Clock the Knee of *Caſſiopea* ought to be in the Meridian: And after this manner in two or three Evenings, the great Inſtrument was exactly pointed in the plain of the Meridian towards that part where this Star ought to paſs, and then kept it in this poſition, becauſe it is very difficult otherways to ſucceed in obſerving thoſe ſorts of heigths which paſs very ſwiftly.

The Meridional diſtances towards the North obſerved between the *Zenith* and the *Knee of Caſſiopea*.

In *Sept.* 1670.	At *Malvoiſine* in a place at a great Farm-Houſe belonging to *Villeroy* ſeated on an eminence in the Pariſh of *Chauqueil*, more South by 18 Toyſes than the Pavilion.	9°	59′	5″.
In *Sept.* & *Oct.*	At *Sourdon* in the Presbyterate Houſe, more North than the Church by 65 Toyſes.	8	47	8
In *October.*	At *Amiens* in the Houſe of the King, more South than the Church by 75 Toyſes.	8	36	10

Every one of theſe Obſervations were taken from a great number of others, of which we took the middle, of which the whole variation or difference exceeded not 5″. Nor will any one wonder that we were able to come to ſo much exactneſs, if he conſider that it was not without exceeding great precaution, that moreover with a Teleſcope of 10 Foot, one need not want 2″ of pointing exactly to a fixed a fixed Star. And that in fine on the Inſtrument that ſerv'd for this purpoſe, the third part of a Minute was at leaſt as big and diſtinct as a whole Minute of the Quadrant above repreſented. In ſuch ſort, that if upon the Quadrant one could determine a quarter of a Minute pretty exactly, and at the ſame time gueſs pretty near at 10″, one might do the ſame thing here to about 3″.

Differences of Latitude.

From *Malvoiſine* to *Sourdon*	1°	11′	57″.
From *Malvoiſine* to *Amiens*	1	22	55.

The time which paſſed between theſe Obſervations required that we ſhould have taken away 1″ from the firſt of the Differences, and that in proportion the laſt ſhould have been diminiſhed by 1½″, but for avoiding a too much affected preciſeneſs, we neglected this Correction.

ARTICLE XI.

Plate the Second.

ALL theſe Obſervations being ſuppoſed, it will be eaſie thence to conclude the magnitude of a Degree upon the Earth. For this effect it muſt be conſidered, that at *Malvoiſine* the Obſervations of Heaven were made at 18 Toiſes more towards the South than the Point E. that on the contrary at *Sourdon*, it was at 65 Toyſes more towards the North than the Point N. And that by conſequence 83 Toyſes ſhould be added to the diſtance of 68347 Toyſes, 3 Foot, which are found between the Parallels of *Malvoiſine* and of *Sourdon*; in ſuch manner that the difference of 1° 11′ 57″, obſerv'd by the Heavens, anſwers upon the Earth to a Meridional diſtance of 68430 Toyſes, 3 Foot, one may thence in fine conclude, That in proportion a Degree ſhall be of 57064 Toyſes, 3 Foot.

The Calculation made by the diſtance of *Amiens* differs not at all from the former, for the diſtance between the Parallel of *Noſtre Dame d' Amiens*, and that of the Pavilion of *Malvoiſine* is of 78907 Toyſe; there ought to be taken from the ſide of *Amiens*, for the place of Obſervation, 75 Toyſes; and on the other ſide to add the 18 Toyſes of *Malvoiſine*; then all the compenſation made, there will be 78850 Toyſes, for the difference of 1° 22′ 55″; and in proportion the degree ſhall be of 57057 Toyſes, which number approaches in ſuch ſort to the firſt, that we were ſurpriſed ſo much the more, that if we had kept account of the Corrections which we have neglected of the differences of Latitude, theſe two Calculations would have been yet more approaching to each other. It is poſſible that this is but an effect of chance, ſince notwithſtanding all the exactneſs we were capable of, we could not anſwer to two Seconds, and conſequently to the value of about thirty two Toyſes, upon every obſervation: We may nevertheleſs ſay with ſome certainty, that we are not very far from the true meaſure of a degree; though one may come to a yet greater preciſeneſs, by meaſuring with the ſame care and with like Inſtruments a diſtance much greater than that of *Malvoiſine* and *Amiens*. We will fix notwithſtanding upon the round Sum of 57060 Toyſes for a degree of a great Circle of the Earth.

'Tis here principally, that the meaſure taken from Pendulums, ought to be imployed, which we have ſuppoſed * univerſal, or at leaſt invariable for every place; and which is to the *Pariſian* Toyſe, as 881 to 864, becauſe following this proportion, the degree ſhall be of 55959 univerſal Toyſes, of which every one contains two lengths of a pendulum of Seconds of mean time, ſo that there wants but 41 of theſe Toyſes upon a whole degree to make up the Round Number of 56000, And by conſequence the degree to be of 28 Univerſal Miles, ſuch as we have determined them.

* Artic. 4.

To the end that ſtrangers may participate of this work, without being obliged to have recourſe to the length of a Pendulum of Seconds, we ſhall give the length of a degree, expreſſed according to the particular Meaſures of which we could gain the knowledg.

Suppoſing then	*The Paris Foot*, *of*	1440 *parts.*
	The Rhein or Leyden Foot	1390.
	The London Foot ——	1350.
	The Boulogne Foot	1686.
	The Braſe of Florence	2580.

A Degree of a Great Circle of the Earth, according to the Meaſures of divers places will contain

Toyſes of the Caſtle of *Paris*	57060.
Paſes of *Boulogne*	58481.
Verges of *Rhein of* 12 *foot each*	29556.
Pariſian Leagnes *of* 2000 *Toyſes*	$28\frac{1}{4}$.
Midling Leagues *of France of about* 2282 *Toyſes*	25.
Marine Leagues of 2853 *Toyſes*	20.
Engliſh Miles *of* 5000 *Foot each*	$73\frac{7}{200}$.
Florence Miles *of* 3000 *Braſſes*	$63\frac{7}{10}$.

The Circumference of the Earth.

Of *Pariſian* Toyſes 20541600.
Of Leagues of 25 in a degree 9000.
Of *Marine* Leagues 7200.

The Diameter of the Earth.

Of *Pariſian* Toyſes 6538594.
Of Leagues of 25 in a degree $2864\frac{56}{71}$.
Of *Marine* Leagues, $2291\frac{59}{71}$.

It may be ſaid, that as we have meaſured the Globe of the Earth by the top of Mountains, or by places more elevated than the reſt, it will follow that a degree, ſuch as we have determined, is bigger than that we ſhould find in going ſtill upon the Sea ſhore, where it ſhould ſeem that the Meaſure ought to be conſiderably leſs: But that we may ſee whether this be ſo, ſuppoſe that the line from *Malvoiſine* to *Sourdon*, be in all its length, equally removed from the borders of the Sea about 35 Leagues, and that conformable to the Experiments that have been made upon the Seine, the declivity of Rivers, which croſs this Line, be about 5 Foot to a League; this ſhall make at moſt but 30 Toyſes of Declivity, even to the Sea, and putting about 50 Toyſes for the height that our Line might have above the Rivers, we ſhall find that this Line might be elevated about 80 Toyſes above the level of the Sea. Whence it would follow that a Degree upon the Sea would be leſs above 8 Foot, than that we have meaſured upon the Land, which is not at all to be conſidered in this matter.

A Table for the value of a Degree of a great Circle of the Earth; divided into Minutes and Seconds.

Minutes	Toyſes.	Seconds	Toyſes.
1	951	1	16
2	1902	2	32
3	2853	3	48
4	3804	4	63
5	4755	5	79
6	5706	6	95
7	6657	7	111
8	7608	8	127
9	8559	9	143
10	9510	10	158½
20	19020	20	317
30	28530	30	475½
40	38040	40	634
50	47550	50	792½
60	57060	60	951

It will not be at all difficult hence to find the differences of the heights of the Pole, for all thoſe places of which we have calculated the * Meridional Diſtances, becauſe 'tis but changing the ſaid Diſtances into Minutes and Seconds, according to the value of a Degree.

* Artic. 8.

The Differences of the Heights of the Pole

between *Malvoiſine* and	*The Obſervatory of Paris*	19′	22″.
	Noſtre Dame of Paris	20	22.
	Mareuil	33	32.
	Clermont	52	00.
	Sourdon	71	52.
	Noſtre Dame of Amiens	82	58.
Between *Noſtre Dame of Paris*, and *Noſtre Dame of Amiens*		62	36.

The height of the Pole at *Paris* in the Garden of the Kings Library, by many obſervations of the Polar Star made in the Winter Solſtices has always been found 48° 53′; you muſt ſubſtract 50″, and you have the height of the Pole of *Paris*, about the Towers of *Noſtre Dame* of 48° 52′ 10″, or if one had rather deſign the middle of *Paris* between the Gates of St. *Martin*, and of St. *James*, which is a little way from St *James* of the *Butchery* or Shambles, the height of the Pole of *Paris* will be 48°, 52′, 20″. And we are certain that if the heights of the Pole be fixed, it will have little change from this, tho in the Obſervatory one may come to a much greater preciſeneſs: we count not the refractions which the Polar ſtar may have, which will be known in time The height of the Pole of *Noſtre Dame* of *Paris* being ſuppoſed we eſtabliſh the following heights of the Pole conformable to the differences here above eſtabliſhed.

The Latitudes and height of the Pole

of	*Malvoiſine*	48°	31′	48″.
	The *Obſervatory*	48	51	10.
	Noſtre Dame of Paris	48	52	10.
	Mareuil	49	5	20.
	Clermont	49	23	48.
	Sourdon	49	43	40.
	Noſtre Dame of Amiens	49	54	46.

The difference of the longitudes of theſe places require a little more of Calculation than that of the Latitudes, becauſe after we had found in a parallel the diſtance between the Meridians of two places, we reduced this diſtance to that which is in the Æquator between thoſe ſame Meridians which were changed into Minutes and Seconds of a great Circle conformable to the Table above. After this manner we found

Sourdon	More *Eaſt* than	*Amiens*	$5'$	$54''$.
Clermont		*Sourdon*	1	9
Mareüil		*Clermont*	0	34.
Mareüil		*Malvoiſine*	0	20.
Mareüil		*Paris*	4	37.

Whence 'tis eaſie to conclude that the difference of Longitude between *Sourdon* and *Malvoiſine* is only $1'$ $23''$, which confirms the firſt thought we had that theſe two places were very near under the ſame *Meridian*.

It follows alſo that *Paris* about the Tower of *Noſtre-Dame*, is not above $3'$ more Eaſtward than *Amiens*. And becauſe that in the Parallel of *Paris* $3'$ amount to 1877 Toyſes, one muſt conclude that *Chaliot*, which may paſs for one of the Suburbs of *Paris*, is very near in the ſame Meridian with *Noſtre Dame* of *Amiens*.

It would be advantageous to Aſtronomy if we knew as exactly the difference of Longitude between the Obſervatory of *Paris* and *Uraniburg*, of which one may account more than two Degrees difference, till ſuch time as by Obſervation made at the ſame time in theſe two places, and compared together, we ſhall be aſcertain'd of the truth.

ARTICLE XII.

Whereas the ordinary method of taking the Level is ſubject to a correction, upon ſuppoſal that the ſemidiameter of the Earth is known, which according to our Calculation is of 3269298 Toyſes 3 Foot; We have judged it ſignificant to give here a Table for the correction of the apparent level, and on that occaſion we ſhall ſpeak concerning refractions which intermingle themſelves with theſe kind of Obſervations, and which hinder them from being ſerviceable for the Meaſure of the Earth.

'Tis known that the true Level requires an equal Diſtance from the Center of the Earth, yet nevertheleſs we ordinarily ſeek the Level in a ſtreight Line, which goes off from the ſaid Center in the manner of a Tangent, hence it is that the true Level is below the apparent.

If inſtead of taking the Level on one ſide only, the obſerver be placed in the middle between the two points which are to be levelld, from each of which he is equally diſtant, he will have in this caſe no correction to make, becauſe the riſings will be equal both on the one ſide and the other ſide: but without being foreced to this method ſince the length of the Semidiameter of the Earth is known, the height of the apparent Level above the true is eaſily found, provided 'tis known at what diſtance one is from the Object ſeen; in the ſame manner as the bigneſs of the ſemidiameter of a Circle being known, and that of a Tangent the exceſs of the ſecant without the Circle is found.

A Table

A Table of the Heights of the appearing Level above the true.

Diſtances.	*Heights of the apparent Level.*		
Toyſes.	Feet.	Inches.	Lines.
50	0	0	$0\frac{1}{3}$
100	0	0	$1\frac{1}{3}$
200	0	0	5
300	0	0	$11\frac{2}{3}$
400	0	1	9
500	0	2	9
600	0	3	11
700	0	5	$4\frac{1}{3}$
800	0	6	$11\frac{1}{3}$
900	0	8	$9\frac{1}{3}$
1000	0	11	0
1500	2	0	9
2000	3	8	0
2500	5	8	$8\frac{1}{2}$
3000	8	3	0
4000	14	8	0

This Table makes it appear that the heights of the apparent level are not at all conſiderable under 1000 Toyſes of Diſtance, but beyond this they may cauſe a ſenſible error, becauſe they increaſe conſiderably, and pretty near, as the ſquares of the Diſtances.

Thoſe who know not by experience what advantage one may now receive by uſing Teleſcope-ſights inſtead of the common ſights, will not fail to ſay that this Table can be of no uſe, becauſe they have not yet had an Inſtrument with which they could diſtinguiſh the difference that there is between the apparent level and the true. We can notwithſtanding aſſure them, with our Quadrant, which was not more than of three Foot Radius, or with the Inſtrument of which we are going to give a deſcription, we determined the level to 18 Inches in a diſtance of 3000 Toyſes, for which, according to the Table, eight Foot and three Inches of correction muſt be made.

The Deſcription of an Inſtrument proper for obſerving the Level.

THE Body of this Inſtrument which is all of Iron, is compoſed of two principal Rules. The Rule A B is three Foot long, and two Inches broad, it is ſtrengthned underneath by another Rule, to the middle of which is fixed the ſtem C D, three Fifth Plate firſt Fig.

Foot and an half long, and perpendicular to the plain of the Rule A B. This ſtem is fitted with two pieces ſet edgewiſe parallel to each other, and which being covered with a very thin Plate, make a ſquare Tube, within which the plumb line or perpendicular G H is incloſed, which is ſeen through two Glaſſes which anſwer to the two extremities thereof. It has alſo a third opening at the bottom of the Tube, through which, with ones Finger, the motion of the plumb may be ſtayed.

Article 5. Upon the plain of the Rule A B is faſtned the Teleſcope E F, which is of the ſame make with that which we have deſcribed for the Quadrant; and tho all the pieces have been already repreſented in the firſt Plate, yet we judged it not impertinent to repreſent it once more in another order, and a bigger ſize: But that we might not be obliged to repeat the Diſcourſe, we have put to it the ſame Letters.

A Painters Æſell ſerves for a ſupport to this Inſtrument, and for accommodating it to the inequality of the ground, the Rule A B is arched underneath with two bows which bear upon the two pins of the Æſell; that it may be eaſie to raiſe or ſink the direction of the Teleſcope as there ſhall be need, without altering the Æſell; and when the ground happens to be unequal, one may lengthen this or that Foot of it by the means of a rod of Iron which is joyned to it.

With this Inſtrument the level may be determined at one glance to a very great diſtance, even much more than is ſet down in the precedent Table. But there is generally one great obſtacle upon the account of refractions, which makes the Objects appear above the line they ought to be ſeen in. For example, in the ſecond Figure let A be the center of the Earth, B C its ordinary ſurface, and D I the tops of the Mountains, we are to conſider that the Earth is inveloped with an Atmoſphere or vaporous Air compoſed of different Regions, which are more ſubtil the further they are removed from the Earth, but in ſuch ſort that the change is not made all at once, but by Degrees, the viſual Ray which comes from a higher place to a lower, as from D to I, which paſſes obliquely from a more ſubtil to a more groſs Air, is continually bent in its way in proportion as it changes the *medium*, which gives it the poſition of a curve line, much like that of D F I, but the Eye that is in I, receives the curve Ray as if it were the Tangent I E, in which it ſees the Object D. For the ſame reaſon if we ſuppoſe another eye in D, it ſees the Object I in the ſtrait line D G. tangent to the ſame bended Ray D F B: And ſuppoſing that the two tangents I E and D G which are in place of the viſual rays cut each other in H, one may imagine that there happens the ſame thing, as if the two Objects D and I were reſpectively ſeen with one only refraction which ſhould be made in H. and which ſhould be equivalent to all thoſe of the true Ray D F I.

For diſcovering of theſe refractions, and alſo for knowing the total value of them which we ſuppoſe reduced to the Angle D H E or I H G. the two Angles A I E and A D G ought to have been obſerved, and moreover the Angle A known, by means of the diſtance B C or I D. changed into Minutes and Seconds of a great Circle of the Earth; becauſe the exceſs of theſe Three Angles above 180 Degrees is the total refraction.

The Third Figure repreſents Two Mountains of equal height, but ſo far diſtant, that the viſual Ray cannot paſs from the top of one, to the top of the other, without ſenſibly approaching nearer to the ſurface of the Earth, and without being conſequently broken or refracted in its way, which 'tis not neceſſary farther to explain. You muſt always ſet apart all the irregularities which may happen every moment in the conſtitution of the Air.

It will be enough for practiſe, that one can inform ones ſelf of the refraction when there is any, and that otherwiſe it may be avoided in the Obſervation of the Level, by contenting ones ſelf with middle ſtations.

Divers Authors report a thing which we have often tryed; which 'tis convenient to note here; that an Object which at break of the Day has appear'd in the Level, and ſometimes a little above it, has afterwards when the Sun is up, appeared below it, and on the contrary after the ſetting of the Sun, Objects far diſtant appear'd to be raiſed ſo ſenſibly, that in leſs than half an Hour their apparent height has been augmented more than Three Minutes.

The cauſe of theſe appearances is, that the coolneſs of the Night condenſes the Vapours, which deſcend to a lower place, leaving the Air of the higher Stations mare pure then in the time of the day, which cauſes a great Refraction on the contrary when the motion of the Sun has made a part of the Vapours to mount to the more elevated ſtations, there muſt be leſs difference of the *Medium*, and conſequently leſs of Refraction.

We ſhall add here one Experiment which makes it appear contrary to the Opinion of ſome Authors, that even at Noon day there remains ſomewhat of Refraction when the diſtance is great, and that the viſual Ray cannot paſs from one place to another without approaching the Earth. The laſt Summer being on the top of the Towers of *Noſtre Dame* of *Paris*, we pointed the quadrant towards the Tower of *Mont Leherie*, and we found that the foot of this Tower was preciſely in the apparent Level: This was about Noon in a very Serene time. Some days after at the ſame Hour, the height of the Tower of *Noſtre Dame*, obſerved from the foot of the Tower of *Montleherie*, appear'd below the Level line 11′. 30″. whereas conformable to the diſtance of 12796 Toyſes, which there are between theſe two places, this Angle ought to have been 13′. 30″. whence it appears that it had Two Minutes of refraction in the whole.

This experiment ſhews what exactneſs one may expect from thoſe who after *Maurolicus* pretend to have found the Magnitude of the Earth, by means of the apparent Level; they ſuppoſe that for this purpoſe, one ſhould chuſe a very high Mountain near the Sea ſhore;

and having meaſured the heigth of this Mountain, one tries upon the Sea at what diſtance the top of it can be ſeen. But the refractions which are yet greater upon the Sea than upon the Land, render this practice fallacious, becauſe they enable us to diſcover Objects at a much greater diſtance than the convexity of the Sea ought to permit, and by conſequence make the Earth appear much greater than in effect it is.

ARTICLE XIII.

IT remains now to Examine the differing Opinions touching the Magnitude of the Earth. And becauſe we can ſay nothing of the Ancients but by Conjecture; we ſhall begin with *Fernelius* who as we ſaid at the * beginning has eſtimated a Degree to contain 56746 Toyſes. *Article 1.

It is without doubt ſurpriſing, that by a manner ſo groſs as his was, he has approacht ſo near to that meaſure which we have concluded on from ſo many Obſervations, the place which he took to be the bound of the Degree he had undertaken to meaſure, was found (by report of the People of the place) as he himſelf ſays, at twenty five Leagues of *Paris*, whence he ſet forth. And beſides, this could not be far out of the Road from *Paris* to *Amiens*; becauſe theſe two Cities are very near, under the ſame *Meridian*, and that he muſt have gone directly towards the North; they commonly account 28 Leagues diſtance between *Paris* and *Amiens*. It was therefore at 3 Leagues on this ſide of *Amiens*, and by conſequence in a place leſs advanced Northwards by 6′. at leaſt, but the difference of the heights of the Pole of *Paris*, and of *Amiens*, is 62′ 36″. whence it follows that *Fernelius* ought not to account above 56′ 36″. when he thought he had advanced a whole Degree; ſo that it muſt neceſſarily be that the Error was compenſated by the eſtimate which he made of the Length of the Way.

As for *Snellius*, who gives not above 55021 Toyſes, if one conſiders what we have elſewhere already taken notice of *, that it is founded upon too little a Baſe; if we add to this, the multitude of his Triangles, the ſmalneſs of ſeveral Angles, the Correction of three, and ſometimes of 4. Minutes, which he was forced to make in the ſame Triangle; and in fine, 'tis not known by what means he obſerved the heights of the Pole; we ſhall leſs wonder that notwithſtanding all his care and pains, he did not ſucceed ſo well as *Fernelius*. *Article 3.

Father *Riccioli* has erred on the other hand, making a Degree to amount to 64363 *Bolnonian* Paces, or to 81 Ancient *Italian* Miles, according as he determins them; but he meaſured not above a third part of a Degree, which is too little, and beſides it is eaſie to ſhew what might have deceived him.

Let us imagine, that in the 2*d* Figure of the 5*th* Plate, I is the top of the Tower of *Modena*, D the top of the Mountain of *Paterne*, near *Boulogne*, and A the Center of the Earth. Father *Riccioli* in his Geography (*lib.5.chap.33.*) aſſures us that by many obſervations made at the times which were leaſt ſuſpected for Refractions he always found the Angle A D I of 89° 26′ 13″ 27‴. and the Angle A I D of 90° 15′ 7″ ſuppoſing that the two terms I and D were viewed by one ſtrait Ray. the ſum of theſe two Angles makes 179° 41′ 20″ 27‴ and by conſequence the Angle A, or the Arch B C, is according to this Obſervation of 18′ 39″ 33‴; but the diſtance is of 20016 *Bononian* paſſes thence by Proportion an intire Degree ſhould be 64363 *Bolougne* paſſes, which make about 62900. Toiſes of *Paris.*

This Method which was propoſed by *Kepler*, appears ſo much the more ſimple, for that there was no need of any Cœleſtial Obſervation, and that it ſuppoſes only that the Plumb or Perpendicular tends directly to the Center of the Earth, which we have alſo ſuppoſed. But we may demand of Father *Riccioli*, how he could be aſſured that in his Obſervations, he had not any thing of Refraction. It was, ſays he, at Noon, in places very high elevated. But beſides, that one of thoſe Places is much higher then the other; the following Experiment joyned to what we have related before, will make one ſee what Judgment ought to be made of this Method.

In the Month of *Auguſt* of the year 1669. the Top of the Hillock of *Mareüil* obſerved at Noon, from the foot of the Tower of *Montleherie*, appear'd below the Level 8′ 20″; and ſome days after at the ſame hour, the foot of the Tower of *Montlehery* reciprocally obſerv'd from the Top of the Hillock of *Mareüil*, was found below the Level 13′ 40″. If there had been no Refraction, theſe two little Angles together would have made the Angle at the Center of the Earth, between *Montlehery* and *Mareüil* of 22′, but the diſtance is 25643. Toyſes: thence in Proportion a Degree ſhould be 69935. Toyſes, which will exceed very much, not only the greatneſs which we have determined by the Heavens; but even that which Father *Riccioli* has found. The Meaſure without doubt will yet come forth much bigger in reſpect to two Objects, that ſhall be further diſtant then *Mareüil* and *Montlehery*: In ſuch ſort that 'tis evident that this method ought to be intirely rejected as fallacious and uncertain.

It may be ſaid, That Father *Riccioli*, underſtanding well what Refractions would do, did not wholy content himſelf with this method; but that he did verify it by Cœleſtial Obſervations. But after what manner ſoever it is in *Italy*, where the Refractions poſſibly are not ſo great as here; We have not at all found that the Obſervations made for the Meaſure of the Earth, by the means of the Level did agree with thoſe of the Heavens, which we can confirm by divers like Examples to thoſe which we have produced: As one may ſee in the Geography of the ſaid Author, (*Lib.* 5. *cap.* 27.) that of the two Obſervations of the Heavens, one of which gave him 19′ 19″, and the other 21′ 16″, of apparent diſtance between the Zenith of

Ferrara, and that of the Mountain of *Paterne*, he made choice of the firſt, as of that which agreed beſt with his Calculation; whereas, if he had followed the ſecond Obſervation, we ſhould have found very little difference between us.

Geogr. Reform. l. 5 c. 37.

The ſame Author for the laſt proof of his Opinion, ſays, That the diſtance from *Avignon* to *Lyons*, taken out of the *Itineraries*, accords perfectly with the difference of the heights of the Pole of thoſe two Cities at the rate of 81. ancient Miles for one Degree conformable to his Opinion. It were to be wiſht that one knew the juſt Diſtance between *Lyons* and *Avignon*; and likewiſe, that one had to that added the diſtance from *Chaalons* on the *Saone*, for one ſhould then have a line of many Degrees almoſt in a Meridian. Nevertheleſs one may anſwer Father *Riccioli*, that the diſtances reckoned by the Itineraries which he cites, were not meaſured with exactneſs enough for the Meaſure of the Earth, and that he will have a conſiderable difference between one Itinerary diſtance, taken in following the great Road, and that which might be meaſured in the ſhorteſt line. Of theſe Itineraries, that which is attributed to the Emperor *Antoninus*, but which do's often paſs under the Name of *Antonius Auguſtus*, is full of conſiderable faults; not giving always the ſame diſtance between the ſame two places, as one may ſee in comparing the Road from *Millan* to *Arles*, with that from *Millan* to *Vienna*. The ſecond Itinerary, which is that of *Bordeaux* and of *Hieruſalem*, ſeems to be the work of ſome particular Perſon, who had deſcribed his own Travels. And a little Examination will ſhew that 'tis different from the firſt in ſeveral places, and that the particular diſtances of ſeveral Places between *Arles* and *Millan*, are not at all found to be the ſame. So that to conclude 'tis not in the leaſt reaſonable to regard ſuch kind of Teſtimonies againſt a meaſure exactly taken.

ERRATA.

PAge 1. l. 25. r. *the*. l. 31. r. *to*. p. 2. l. 41. r. *Alcmar*. p. 3. l. 6. r. *for*. p. 4. l. 30. r. *five*. p. 8. l. 11. r. *fifth*. p. 12. l. 19. 21658. p. 13. l. 4. r. $3''$. $14'''$. l. 34. r. 42°. $27'$. $30''$. l. 35. r. 49°. $24'$. $30''$. p. 16. l. 35. r. *this*. p. 18. l. 16. r. *G I*. p. 19. l. 3. r. *Amiens*. l. ult. r. 9073. p. 23. l. 4. r. 8871. l. 16. r. 11757. p. 27. l. 8. r. *be turned*. p. 28. l. 25. r. *Area*. p. 30. l. 8. r. 1°.

FINIS.